FERNALD CITIZENS TASK FORCE

A U.S. DEPARTMENT OF ENERGY SITE SPECIFIC ADVISORY BOARD

To the Reader: July, 1995

The report that follows concludes a chapter of the history of the Fernald site. It records the results of a remarkable experiment in public participation in environmental decision making. In the summer of 1993, the Department of Energy, together with its regulators, the U.S. Environmental Protection Agency (Region V), and the Ohio Environmental Protection Agency, convened the Fernald Citizens Task Force to make detailed recommendations on the central issues posed by the remediation of the Fernald Environmental Management Project. Two years later, the task force has reached consensus (and in nearly all cases unanimity) on those issues. Since the consensus process included the Department and its regulators, the task force's recommendations in effect provide an outline for the near-term and in some areas the long-term future of the Fernald site. This in turn should enable the Department to move forward decisively to remediate the site and to return much of it to locally beneficial uses.

The success of the task force process can be attributed to many factors, but I want to emphasize three. First, the task force received solid and enthusiastic support from the Department of Energy, U.S. Environmental Protection Agency, and the Ohio Environmental Protection Agency. Tangible support–financing, information, time, and expertise–has been amply provided by the Department and by its contractor, the Fernald Environmental Restoration Management Corporation (FERMCO). Many, many individuals in the Department and FERMCO gave unstintingly of their time and energy to provide information, advice, and other kinds of assistance to the Task Force. Their names (and I apologize in advance for any inadvertent omissions) are listed in Appendix H.

Second, the task force has enjoyed an efficient and dedicated administrative staff since its inception. The efforts of Sarah Snyder and her successor Judy Armstrong, FERMCO employees detailed to the task force, have been instrumental to our work. The task force was also extremely fortunate to obtain the services of Douglas J. Sarno, Phoenix Environmental Corporation, as our technical consultant. His considerable talents in identifying, assembling, digesting, translating, and presenting key issues and information were essential to the successful completion of the Task Force's work. I know that all of the members of the task force join me in appreciation of his many contributions to our efforts.

Most important, I want to recognize the task force members themselves. They have endured a barrage of technical information, seemingly endless Saturday mornings in windowless meeting rooms, and the responsibility for hard choices among often unpleasant options. Their faithfulness in attending meetings, seriousness of purpose, consistent civility and above all their unswerving commitment to getting something done has been a model for responsible citizen involvement in public policy.

This report concludes a chapter, but it does not close the book on Fernald. While we can feel heartened, as the report goes to press, that remediation of the Fernald site may indeed be largely completed in the foreseeable future, there is still much that remains to be done. It is my hope that this report and the hard work behind it will provide a valuable outline for the next chapters in the Fernald story.

John S. Applegate
Chair, Fernald Citizens Task Force

P.O. BOX 544 ROSS, OHIO 45061 513-648-6478

EXECUTIVE SUMMARY

The Fernald Environmental Management Project site is a 1,050-acre facility operated by the United States Department of Energy (DOE), which was once a major part of the nation's nuclear weapons complex. Located approximately 18 miles northwest of Cincinnati, Ohio, Fernald was in operation between 1951 and 1989. Over that period of time, more than 500 million pounds of high-purity uranium metals were produced. One significant consequence of this activity was the release of over 1 million pounds of uranium into the surrounding environment. Now that the plant is closed, efforts have turned to the environmental damage and human health risk resulting from nearly 40 years of production.

Over 3 million cubic yards of waste and contaminated material must be safely managed before the Fernald site can conclude its contribution to the cold war. DOE established the Fernald Citizens Task Force in August 1993 as a site-specific citizens advisory board for the Fernald facility. The Task Force was chartered to provide DOE, the U.S. Environmental Protection Agency (EPA), and the Ohio Environmental Protection Agency (OEPA) with recommendations regarding four specific questions:

1) What should be the future use of the Fernald site?
2) What residual risk and remediation levels should remain following remediation?
3) Where should the waste be disposed?
4) What should be the priorities among remedial actions?

This report is the culmination of the effort of the task force to answer these four questions.

The task force began its work in September 1993 and developed and released its recommendations over a seven-month period from November 1994 through May 1995. Each recommendations is supported by a detailed discussion of issues and rationale. With the exception of waste disposition, all recommendations represent full consensus of the board.

Recommendations on Remediation Levels

The Task Force established remediation levels to protect the Great Miami Aquifer and to provide consistent protection of human health across all environmental media and land uses. The task force sought to balance the absolute requirement to protect human health and safety with the desire to minimize the impact on the environment resulting from remediation itself. To achieve background conditions would require surface soil excavation for five miles surrounding the site, a consequence

the task force found unacceptable. Ultimately, the task force arrived at recommended remediation levels which were protective and required little off-site excavation. These levels were based on restoring and protecting the aquifer to conform with maximum contaminant levels under the Safe Drinking Water Act, and to keep cancer risks within one in ten thousand, and non-cancer risks below the EPA hazard index of one.

Recommendations on Waste Disposition

The Fernald Citizens Task Force evaluated the political and logistical considerations involved in disposing of over three million cubic yards of contaminated material and determined that a balanced approach in which less hazardous waste was disposed of on-site and more hazardous waste was disposed of off-site was most prudent. Of paramount importance was ensuring the removal of the highest level wastes off-site for safe disposal and that no new wastes come to Fernald for disposal. The task force, therefore, concurred with existing DOE, EPA and OEPA decisions that the most highly contaminated materials be disposed of off-site, and recommended that an on-site disposal facility be constructed to accept materials with low levels of contamination from the Fernald site only.

Recommendations on Priorities

Originally, site priority recommendations were envisioned as a sequencing of activities according to their importance to the concerns and goals of stakeholders. However, as dramatic cuts in the DOE budget began to occur, the nature of the problem shifted. Reduced annual budgets resulted in remediation time frames stretching to 25 years. At the same time, total projected costs of remediation were twice what could be achieved with more repaid remediation, due to the high costs of keeping the facility open. The Task Force concluded that such a lengthy approach to remediation would not remove the highest level contaminants from the site quickly, nor conduct remediation in a cost-effective manner. Therefore, the Task Force recommended that Fernald accelerate remediation by achieving total source control with in an approximately 10-year schedule. This schedule will both provide both rapid protection of human health and the environment and greatly reduce the overall costs of remediation.

Recommendations on Future Use

The Fernald Citizens Task Force focused its future use recommendations on creating a broad understanding of how the Fernald site could best be used following remediation, rather than identifying specific land use plans for the property. The Task Force believes that specific uses of the property would best be determined at the time of reuse by the people most impacted by that use, within the general guidelines established by the Task Force. As part of these general guidelines, the Task Force recommended that residential and agricultural uses be avoided on the property. However, it was also important to the task force that the land be used productively. Accordingly, remediation levels recommended by the Task Force allow for all other use, including recreation and industry. The Task Force also recommended that a substantial buffer area separate the on-site disposal cell and any other uses of the property.

Next Steps

The initial mission of the Fernald Citizen's Task Force has been completed with this presentation of its recommendations. Task force members, DOE, EPA, and OEPA feel the task force's usefulness has not ended however. Continuing task force activities are expected to include monitoring the implementation of task force's recommendations throughout the design and construction phases, evaluating closure, and long-term monitoring of the facility. The task force will reconvene in the fall of 1995 to evaluate these options and to plan future activities.

I. INTRODUCTION

This report was prepared by the Fernald Citizens Task Force to transmit its formal recommendations to the U.S. Department of Energy (DOE), the U.S. Environmental Protection Agency (EPA), and the Ohio Environmental Protection Agency (OEPA) regarding environmental remediation of the Fernald Environmental Management Project.

The Fernald Citizens Task Force was established in August 1993 by DOE, EPA, and OEPA as a site-specific citizens advisory board for the Fernald facility. Chartered under the Federal Advisory Committee Act, the Task Force was created to provide DOE, EPA, and OEPA with recommendations regarding four specific questions:

1) What should be the future use of the Fernald site?
2) What **residual risk** and **remediation levels** should remain following remediation?
3) Where should waste materials be disposed?
4) What should be the priorities among remedial actions?

A detailed description of recommendations for each of these issues is reported in Section V, "Task Force Recommendations."

The report also presents background information on the Fernald site and the Fernald Citizens Task Force. The background information on the site has been included to help the reader to understand the technical base for the Task Force's recommendations and how they were developed. This background information also helps to frame the Task Force's recommendations. The recommendations outlined in this report are based upon the accuracy

and validity of information that was provided to the Fernald Citizens Task Force as summarized in this report. Should any key information prove erroneous or change significantly in the future, then certain recommendations may require reconsideration.

A final purpose of this report is to provide the reader a complete understanding of how the Fernald Citizens Task Force was organized and how it developed its recommendations. Section III, "Task Force Organization and Approach," describes the organization of the Task Force. Section IV, "Task Force Decision-Making Process" describes the process the Task Force used to make decisions. Selected materials are included as appendices to present a more detailed record of the Task Force's operations and deliberations. A glossary of technical terms used in this report appears at the end of the main text. Words found in the glossary are printed in **bold type** the first time that they appear in the report.

II. OVERVIEW OF THE FERNALD FACILITY

History

The Fernald site in southwestern Ohio was first established under the auspices of the Atomic Energy Commission, now the U.S. Department of Energy (DOE), as the Feed Materials Production Center (FMPC). Ground was broken on May 16, 1951. Production of uranium metal for use in nuclear weapons began on October 11, 1951 and continued for nearly 40 years. More than 500 million pounds of high-purity uranium metals were produced for use throughout the nation's **Nuclear Weapons Complex**. The facility was operational until 1989, when production stopped and DOE changed Fernald's mission to environmental restoration. In 1991, DOE renamed the site the Fernald Environmental Management Project (FEMP).

Environmental remediation activities began at the Fernald site in 1986 under a **Federal Facility Compliance Agreement** between DOE and the U.S. Environmental Protection Agency (EPA). Little remediation progress had been made when the facility was placed on the **National Priorities List** in 1989, formally making it a **Superfund** site.

In April 1990, a **Consent Agreement** between DOE and EPA was signed in accordance with Superfund regulations. Amended in September 1991, this Consent Agreement provides the guidelines by which environmental remediation activities at Fernald are conducted. It identifies a specific schedule for compliance with the **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA) requirements for conducting **remedial investigations** (RI) and **feasibility studies** (FS), and reaching **records of decision** (ROD). In accordance with the consent agreement, DOE has been engaged in a thorough investigation of the

facility and surrounding lands to provide a detailed understanding of the environmental damage and human health risks created by uranium production at Fernald. At the time of this writing, these investigations are nearing completion and decisions regarding the most appropriate remediation approaches and schedules are being reached.

To address the contamination problems at Fernald, DOE and EPA have organized and managed the site as five **operable units** (OUs). Each of these operable units is composed of areas of the site that have similar characteristics:

OU 1: Waste pits 1-6, clearwell, burnpit, berms, waste pit liners, and soil within the operable unit boundary;

OU 2: Fly ash piles, south field disposal areas, lime sludge ponds, solid waste landfill, berms, liners, and soil within the operable unit boundary;

OU 3: Former production area, including all production-associated facilities and equipment and all other materials and waste in the former production area;

OU 4: Silos 1-4, berms, decant sump tank system, and soil within the operable unit boundary;

OU 5: Groundwater, surface water, all soil not included in OUs 1-4, sediments, and fauna.

A map identifying the location of each operable unit is shown in Figure 1. Because technical information was developed separately for each operable unit, and because the regulatory schedule is based on them, the Task Force generally followed this organization in its consideration of the site.

Setting

The Fernald property consists of 1,050 acres in a primarily rural setting approximately 18 miles northwest of downtown Cincinnati. Surrounding properties consist of agricultural and residential development with some light industry within a two-mile radius. Uranium production operations were concentrated

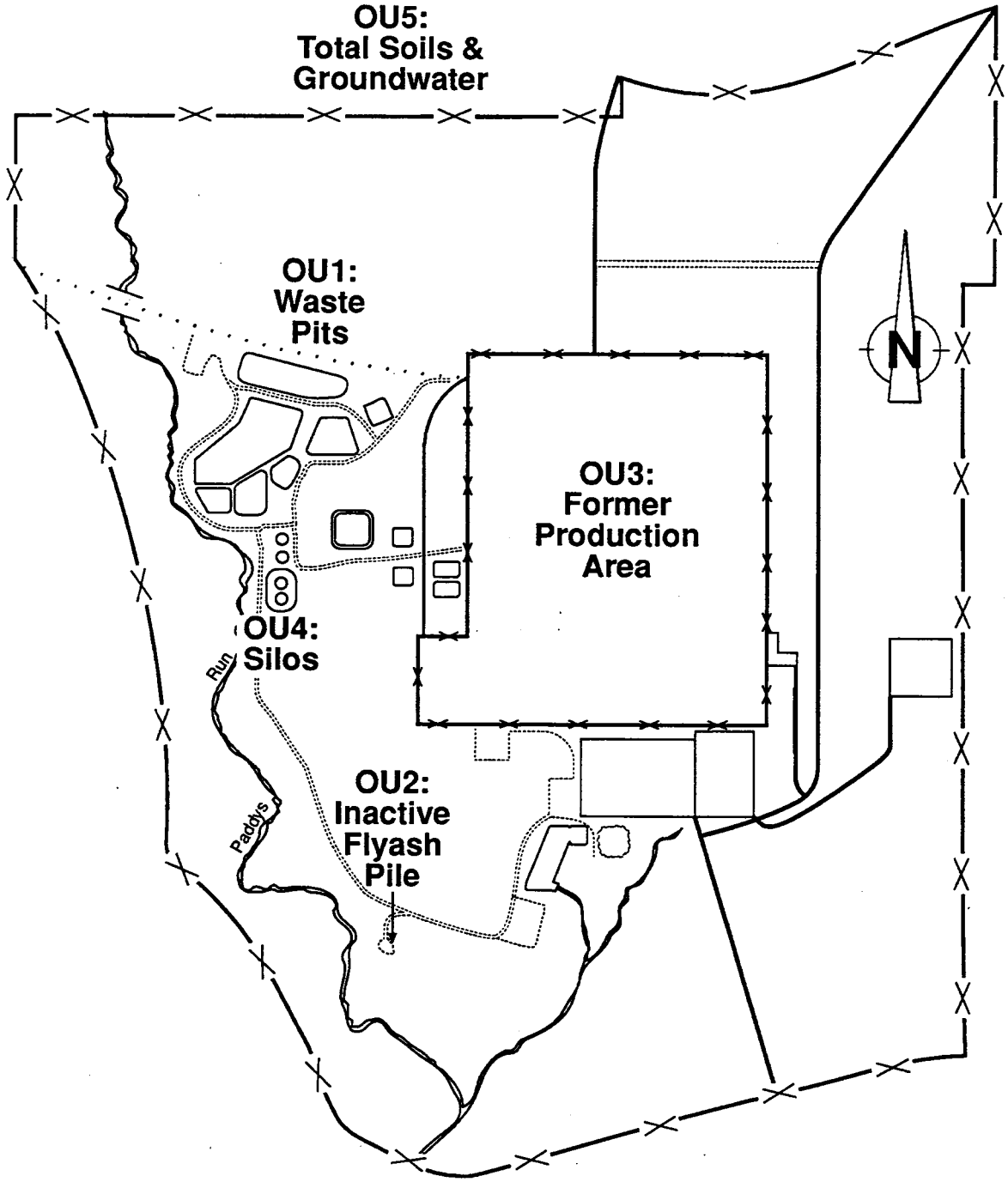


Figure 1. Location of Fernald Operable Units

within a 136-acre industrial area in the center of this property. The on-site property surrounding Fernald's former production area includes: to the west, several large, open pits for waste storage; to the north, forested wetlands; a small intermittent stream, Paddys Run, which parallels the western edge of the Fernald property from north to south; and open fields leased for cattle grazing at the site's perimeters. A map identifying land uses and natural resources at the site is shown in Figure 2.

The Great Miami **Aquifer,** a **sole source aquifer**, underlies the entire 1,050-acre site. Groundwater from the Great Miami Aquifer is a major source of drinking water in the region. In all, the Great Miami Aquifer covers much of southwestern Ohio and is one of the largest drinking water aquifers in the nation, containing almost 10 trillion gallons of water. As much as 5.8 billion gallons of water, or 0.062% of the total aquifer, has been contaminated above **background levels** of uranium as a result of releases from the Fernald site.

Significant natural features of the site include the northern wetlands and Paddys Run, an intermittent stream which is inhabited by an endangered species of crayfish. At certain intervals, water from Paddys Run enters the Great Miami Aquifer, carrying contaminants from runoff into this groundwater. Paddys Run also feeds into the Great Miami River, which lies approximately one-half mile south and east of the Fernald site.

The soil immediately beneath the Fernald site consists of a clay-rich **glacial overburden** which is up to 50 feet thick at the northeast corner of the site and thins to nothing near Paddys Run. This clay layer contains silty sand lenses which contain a **perched aquifer** system that is not used as a source of drinking water. Beneath the clay layer is a thick sand and gravel layer containing the Great Miami Aquifer.

Contamination

Production and disposal activities, wind, and runoff during nearly 40 years of operation have resulted in widespread contamination from uranium and other hazardous and radioactive chemicals on and near the 1,050-acre site. These materials include drummed nuclear waste materials, bulk waste in pits and silos, **mixed waste**, and contaminated soil and debris. Based on the remediation levels recommended by the Task Force, over 3 million

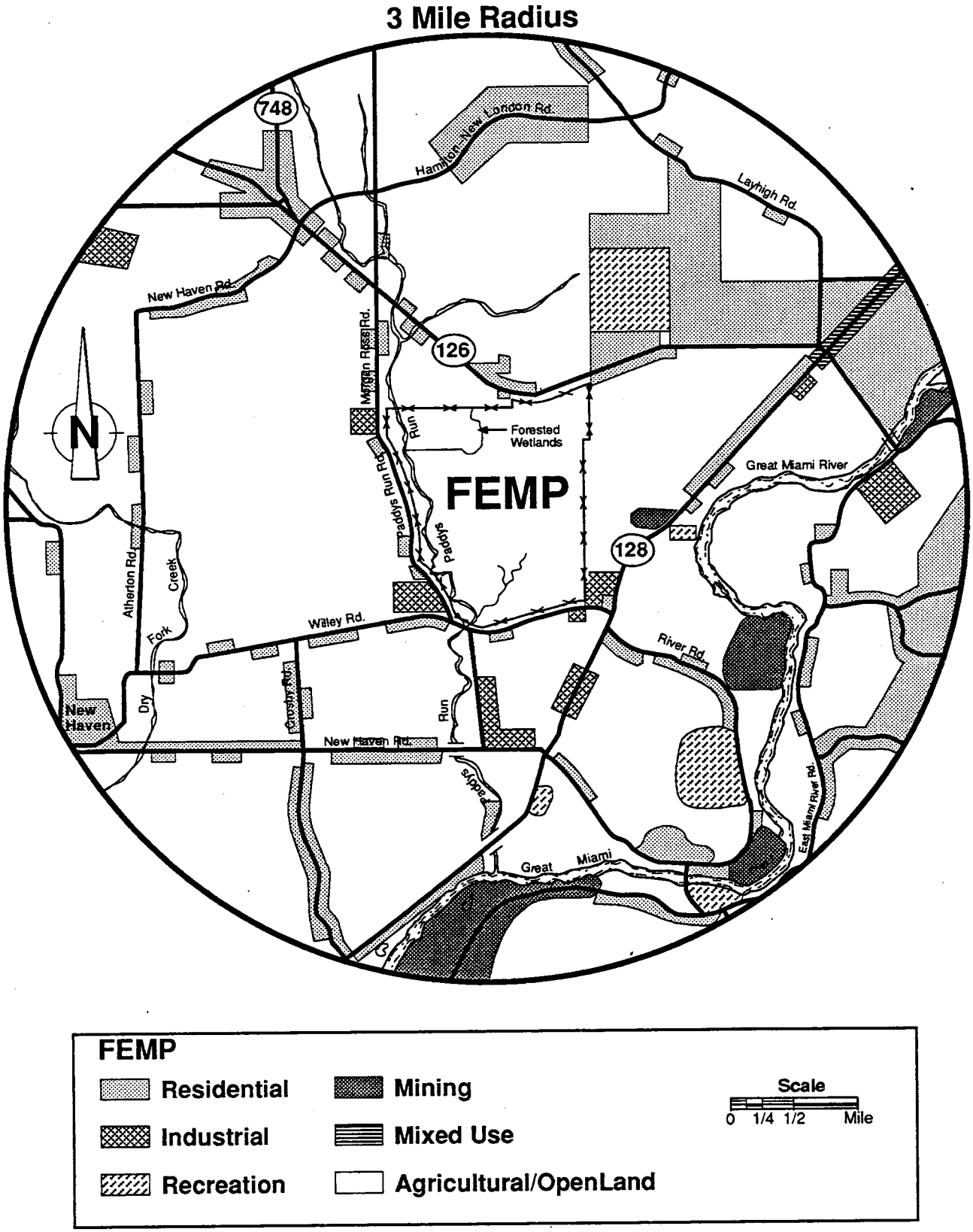


Figure 2. Land Use and Natural Resources at Fernald

cubic yards of waste and contaminated material will require disposal. However, if background-level conditions were to be sought, the volume of material to be managed would increase substantially. Figure 3, "Waste Volumes and Disposition Options," provides a breakdown of waste materials by location, volume, and severity, according to Task Force recommended remediation levels, and identifies potential options for disposal.

Approximately 100 **contaminants of concern** have been identified at Fernald. These contaminants of concern are located throughout the former production area, waste pits, and silos, and in site soils and groundwater both on and off the site property. Many of the chemical contaminants are typical of those found at industrial operations, such as **solvents**, **asbestos**, **polychlorinated biphenyls** (PCBs), and **heavy metals**. In addition, the Fernald site is heavily contaminated with radioactive compounds including **uranium**, **thorium**, **radium**, and **radon**. Uranium, by a wide margin, is the most prevalent contaminant found in the soil and groundwater at Fernald. The remediation of uranium will generally capture all other contaminants of concern.

In the **Fernald Dosimetry Reconstruction Project**, the Centers for Disease Control estimated that Fernald released as many as 1 million pounds of uranium into the environment. Very high concentrations of uranium exist in soils at depths up to 20 feet in the former production area as a result of leaks, spills, and runoff during production. Airborne uranium has also resulted in widespread contamination of surface soils outside of the former production area. Because uranium is relatively heavy, most particles fell to the ground near the former production area. However, enough uranium was carried as far as 5 miles from the site to exceed background levels over an area of 11 square miles.

The highest level of radioactivity at Fernald is found in three concrete storage silos to the west of the former production area. Two of these silos, Silos 1 and 2, contain 216,300 cubic feet of wet waste residues, known as the K-65 material, generated from processing high grade uranium ores. This processing was conducted during the 1950s at both the Fernald site and at the Mallinckrodt Chemical Works in St. Louis to extract uranium from the natural ores. These silos were constructed in 1951 to provide temporary storage; however, the waste material was never removed. The high concentrations of radium in these silos result in the production of dangerous levels of radon gas. This radon problem has been temporarily controlled by placing a thick clay layer at the

Figure 3. Waste Volumes and Disposition Options

WASTE CATEGORY	VOLUME (yd^3)	% OF TOTAL	RELATIVE HAZARD	DISPOSITION OPTIONS			
				Utah	NTS	Reuse	Onsite
Operable Unit 1							
Pit Residues/Liners	628,200	20.4	moderate	x			
Subtotal Volume	628,200	20.4					
Operable Unit 2							
Ash	108,600	3.5	low	x	x		x
Solid Waste	15,220	0.5	low	x	x		x
Lime Sludge	16,500	0.5	low	x	x		x
Pit Residues/Liners	208,280	6.8	low	x	x		x
Subtotal Volume	348,600	11.3					
Operable Unit 3							
Nonrecycleable Debris	158,400	5.2	low	x	x		x
Recycleable Debris	43,200	1.4	low			x	
Subtotal Volume	201,600	6.6					
Operable Unit 4							
K-65 (silos 1 and 2)	9,000	0.3	high		x		
Silo 3 Contents	5,000	0.2	moderate		x		
Miscellaneous Debris	3,000	0.1	low	x	x		x
Subtotal Volume	17,000	0.6					
Operable Unit 5							
Soil	1,775,000	57.7	low	x	x		x
Water Treatment Sludge	60,000	1.9	low	x	x		x
Subtotal Volume	1,835,000	59.6					
Legacy Wastes							
Nuclear Material Inventory	10,160	0.3	moderate			x	
Containerized Waste	35,600	1.2	moderate	x	x		
Thorium	1,000	0.03	high		x		
Subtotal Volume	46,760	1.5					
Total Waste Volume	**3,077,160**	**100.0**	all				
Off-site Selected	**689,284**	**22.4**	mod-high				
Disposal to be Determined	**2,387,876**	**77.6**	low				

top of each silo. Because of its very short half-life, most of the radon decays before it is able to escape from the clay.

The Silo 3 contents are substantially different from those in Silos 1 and 2. Silo 3 contains "cold" metal oxide waste residues generated at Fernald during uranium extraction operations in the 1950s. These residues are dry, and though the radiological constituents are similar to those in Silos 1 and 2, certain radionuclides, such as radium, are present in Silo 3 in much lower concentrations. Silo 4 was never used and remains empty, except for rain water.

North of the silos are six waste pits that contain a total of 628,200 cubic yards of solid and semi-solid wastes of varying types and concentrations. Fly ash and sludges from industrial operations were also disposed in landfills west and south of the former production area. In the former production area, numerous contaminated structures and equipment require decontamination and disposal, as well as thousands of drums of existing ("**legacy**") waste awaiting off-site disposal.

As a result of leaching through soil and runoff into Paddys Run, a large plume of contamination is present in the Great Miami Aquifer beneath the Fernald site and some distance south, beyond the site boundary. DOE has provided a number of homes with bottled water as a result of Fernald-related contamination and is partially funding a project to provide area residences with a public water supply. Five pumping wells south of the Fernald site boundary were installed in an effort to halt further migration of the contamination plume until full-scale groundwater remediation can begin.

III. TASK FORCE ORGANIZATION AND APPROACH

Planning for the Fernald Citizens Task Force began in early 1993 and the first meetings were held in September 1993. This section describes the approach used in planning and organizing the Task Force. A timeline of key Task-Force-related activities and a summary of all regular Task Force meetings can be found in Appendix A.

Convening the Task Force

Though small in size compared to other DOE sites, Fernald has received significant national publicity. In the 1980s, it was discovered that the Fernald facility had been contaminating local drinking water for many years. Sued separately by local residents and by the State of Ohio, DOE began to address site remediation and paid $78 million in damages to area residents for past actions. Diminishing trust of the Department and its contractors resulted in strong grassroots citizen activity. In 1984, Fernald Residents for Environmental Safety and Health (FRESH) was established and has been a leader in pressuring for remediation efforts throughout the Nuclear Weapons Complex.

As work progressed under the 1991 Amended Consent Agreement, DOE managers at Fernald recognized that many important, far-reaching decisions surrounding remediation of the Fernald site would have a profound impact on the long-term interests of local citizens. The DOE managers also realized that direct citizen involvement would be essential to making sound decisions. In the spring of 1993, DOE decision makers at Fernald decided that a citizens advisory board would be the most effective means of obtaining focused **stakeholder** input on the most pressing issues regarding remediation of the Fernald site.

At about the same time, a model of citizen participation was emerging from the **Federal Facilities Environmental Restoration Dialogue Committee** (FFERDC), as described in its February 1993 interim report. The FFERDC recognized that individuals affected by environmental remediation activities ("affected stakeholders") were not being given sufficient opportunity for meaningful dialogue or to provide input regarding the remediation process. The FFERDC recognized that opportunities were needed for the full spectrum of stakeholders to voice their interests and concerns.

To correct this situation, the FFERDC recommended establishing independent public bodies, called site-specific advisory boards (SSABs), to provide policy and technical advice regarding key remediation decisions to the regulated and regulating agencies. The FFERDC interim report suggested that establishing SSABs would improve decision making by:

1) Providing a setting for direct, regular contact between agencies and a diverse set of stakeholders;

2) Providing a forum for stakeholders and agencies to understand the competing needs and requirements of the government and the affected communities;

3) Providing a forum for discussing citizen issues and concerns, thus enabling the development of a more complete and satisfactory plan or decision;

4) Enabling citizen review and the evaluation of plans and their technical adequacy in more depth than is possible in most single opportunity public participation efforts;

5) Permitting a more detailed consideration of issues than is possible as a result of the minimal legal requirements identified in various state and federal laws; and

6) Broadening consideration of issues to include values as well as facts.

By the time the SSAB concept was officially adopted by DOE, the Fernald Citizens Task Force was already established as one of the first SSABs in the Nuclear Weapons Complex. The process used at Fernald to establish the SSAB refined and expanded upon the ideas coming out of FFERDC.

To provide timely and fair identification of potential SSAB members, an independent convener was employed. In May 1993, DOE, USEPA, and OEPA worked through the Alliance of Ohio Universities to hire Dr. Eula Bingham, a professor at the University of Cincinnati and a former Administrator of the Occupational Safety and Health Administration. Her role was to identify potential candidates for membership on the board, interview the candidates, and deliver a slate of recommendations to DOE. During the summer of 1993, Dr. Bingham used a combination of public meetings, mass mailings, and personal recommendations from local officials and stakeholder groups to identify potential candidates for the board. DOE accepted the complete slate of candidates presented by Dr. Bingham, and the board was formally established in August 1993 as the Fernald Citizens Task Force.

The convener also was asked by DOE to identify a chair for the Task Force and to develop a draft charter for the board in conjunction with the DOE, EPA, and OEPA. Dr. Bingham identified John Applegate, a professor of environmental law at the University of Cincinnati, to serve as the chair. The charter that she drafted charged the Task Force to address four specific and far-reaching issues: future use, remediation levels, waste disposition, and remediation priorities for the Fernald site.

Membership

Dr. Bingham recommended 14 members and 2 alternates to serve on the board. Two of these nominees cited time constraints and declined; one by stepping down completely and the other by switching with an alternate. An additional individual petitioned for membership immediately after the board was established. The charter members recommended that this individual be appointed. DOE made the appointment. To provide member continuity over time, half of the members were given two-year terms, and half were given three-year terms. In addition, representatives from DOE, EPA, and OEPA were placed on the Task Force as non-voting *ex officio* members.

This report was completed within the original terms of all 14 members; all of the original members have served on the Task Force for the entire period. The alternates were fully informed of all Task Force activities; however, they attended no Task Force meetings and did not participate in any Task Force deliberations.

In accordance with the FFERDC report, the 14 members of the all-volunteer Task Force represent a broad spectrum of interests and backgrounds that are critical to the remediation decisions at Fernald. Eight members live or work in the direct vicinity of the site. The remaining members were selected to reflect a combination of skills, interests, and constituencies that are important to the remediation of the Fernald property. All live and work within the greater Cincinnati area. Task Force members received no compensation for their time; only out-of-pocket travel expenses were reimbursed. Brief profiles of the Task Force members are provided in Appendix B, "Member Profiles."

Charter and Ground Rules

Initial meetings of the Task Force were devoted to site orientation and developing the group's path forward. Using the charter drafted by Dr. Bingham as a starting point, the Task Force worked during the first few months to clearly identify its mission, approve its charter, and develop ground rules. The charter and ground rules are included in Appendix C, "Charter and Ground Rules."

The Task Force formally reports to the DOE Assistant Secretary for Environmental Management, the EPA Region V Regional Administrator, and Director of the OEPA.

This report represents the completion of the Task Force's original charge to provide recommendations regarding future use of the Fernald property, remediation levels, remediation priorities, and waste disposition.

Organization and Staffing

Task Force meetings were held monthly, originally on a weekday evening and then on Saturday mornings to provide for longer meetings. Every effort was made to hold these meetings in the direct vicinity of the site; however, space requirements and the desire to reduce costs resulted in the meetings being held in vari-

ous locations, some further from the site than others. Ultimately, a facility used by the site contractor and available to the Task Force at no additional expense was identified as the permanent location of meetings. All meetings were open to the public and widely publicized in local papers and through mass mailings. Sufficient space for public attendance was always available. Time for public comment was provided at each meeting.

Most of the group's work was performed during the Task Force's regular monthly meetings. On several occasions, important issues were raised which were either outside of, or more in depth than, the immediate scope of the Task Force mission. In these instances, the Task Force established a subcommittee to address the issue and report back to the entire board. Subcommittees generally contained three to five board members and were chaired by a member charged with completing the product required. In total, four subcommittees were formed to address technical support, membership, groundwater remediation standards, and waste disposition issues. Individual Task Force members also serve as liaisons to other national and local committees.

In accordance with its charter, the Task Force chair was responsible for overall organization and administration of the advisory body. Administrative support was provided by DOE's site contractor, the Fernald Environmental Restoration Management Corporation (FERMCO). One full-time staff member and clerical staff worked under the direction of the chair to provide the many organizational and logistical services necessary to plan and run Task Force activities. In addition to this dedicated staff, FERMCO provided continuous and invaluable support to all aspects of Task Force operations.

Task Force members believed that it was essential to obtain independent technical support to assist in developing accurate information. The Task Force realized it had to focus its time and energy effectively to best use its limited resources. Meeting more than once per month for approximately four hours was seen as untenable. Some members were able to devote more time, but most could not. Early, the Task Force realized the need for significant staff support to help gather and synthesize pertinent information and to develop a detailed decision-making process.

The Task Force therefore decided that it must obtain technical and facilitation support from a source other than DOE and the site contractor to ensure independence and neutrality. The Task

Force created a selection subcommittee and, working with DOE, selected and contracted with Douglas J. Sarno of Phoenix Environmental to serve as a consultant directly to the Task Force. Sarno began working with the Task Force in December 1993. In addition, the Task Force retained funds to contract with outside experts on specific issues should the need arise. This was done only once, to hire an expert to review risk assessment results for cattle grazing on leased property at the Fernald site.

Approach to Achieving the Task Force Mission

During its first months, the Fernald Citizens Task Force established a general strategy for conducting its business. Because of the enormous breadth of its mission, a clear organization of issues was needed to focus the Task Force's efforts. It became apparent to Task Force members that a decision with regard to the future use of the Fernald property following remediation would give direction to its deliberations and also provide needed insight to its recommendations. Actual target concentrations for contaminants of concern were directly tied to the **exposure scenarios** generated as a result of the anticipated future use of the Fernald property. These target concentrations, in turn, would drive total volumes of waste material, which would help to determine appropriate locations for the long-term disposal of wastes, and ultimately the desired timing of activities. Thus, the Task Force organized its decision-making process around the questions of future use of the Fernald property.

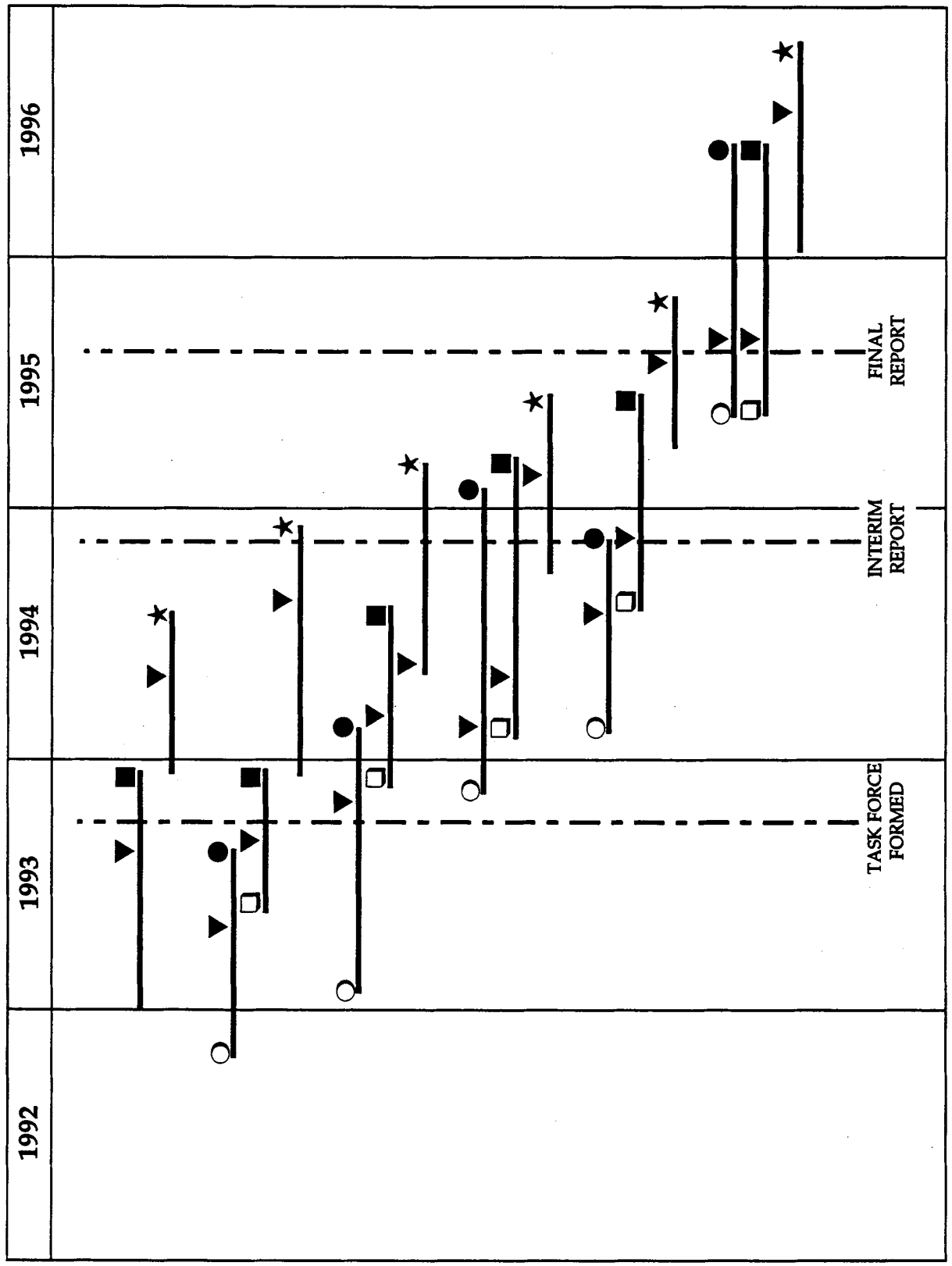
In December 1993, the Task Force consultant's first task was to develop a detailed work plan for the group to achieve its mission based on the future use focus. Task Force decision making was scheduled so that needed information was developed and recommendations were made in time to affect DOE decisions. The Task Force was feeling pressure because the DOE decision-making process was well underway, and there did not appear to be enough time to catch up. Several of the five operable units were progressing toward records of decision. The schedule for decision making outlined in the Amended Consent Agreement identified key milestones for each of the five operable units. Described in the following table, the dates represent the first submittal of DOE documents to EPA.

Milestone:	OU3 (Interim)	OU4	OU1	OU2	OU5	OU3 (Final)
Draft RI	n/a	4/19/93	10/12/93	2/18/94	6/24/94	9/11/95
Draft FS/ Proposed Plan	8/13/93	9/10/93	3/7/94	4/29/94	11/16/94	9/11/95
Draft ROD	4/8/94	8/9/94	11/7/94	2/4/95	8/2/95	7/25/96

To overcome these time constraints, the Task Force work plan was developed by first defining the existing timeline for DOE decision making at the site and then identifying where the Task Force would need to provide input for its recommendations to be effective. The Task Force realized that the key decisions in which it would be providing input would actually not be made until July 1995, coinciding with the draft OU5 ROD. This gave Task Force members time to work at the level of detail they desired. In January 1994, a detailed work plan was developed and approved to follow an 18-month schedule, concluding with this July 1995 report. A comparison of the Amended Consent Agreement schedule and the Task Force schedule is shown in Figure 4.

The work plan was designed to focus on the four key recommendations requested of the Task Force: future use, remediation levels, priorities, and waste disposition. A key to this work plan was the conscious decision of the Task Force not to review and evaluate each decision and piece of information that would be released by DOE over that time period, but to focus solely on achieving its own objectives in the time available. As the work progressed, the Task Force learned how site decisions were being made and how the Task Force might impact those decisions. Following the release of its interim report in November 1994, the Task Force decided to review activities planned for 1995 to ensure that its ultimate recommendations were focused on the most important issues. As a result, a new work plan was developed and approved in December 1994 which refined the activities planned for 1995.

Figure 4. Schedule of Key Fernald Activities and Task Force Milestones



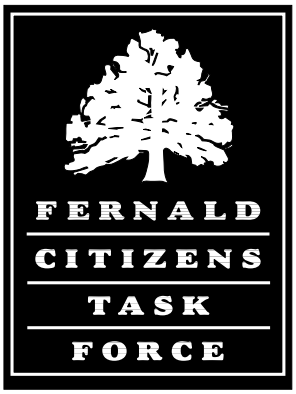
Getting Broad Public Involvement

From the beginning, the Task Force recognized that no single group could represent every viewpoint of the public interested in the Fernald environmental remediation. Effective recommendations required broader input from the public. Though DOE and FERMCO had an active and effective public involvement program, the Task Force believed that it needed to conduct its own outreach efforts to make clear its differentiation from DOE and to obtain specific input to the issues under consideration. Therefore, a number of activities were used to ensure that broader public input was considered.

Particular focus was placed on public input regarding the more controversial issues, such as waste disposition. To ensure that all sides were heard, the Task Force mailed personal invitations to stakeholders, identifying the issues and decisions to be addressed in upcoming meetings. The Task Force sponsored two workshops to enhance public understanding and involvement in the remediation levels, future use, and waste disposition issues. Specific activities included:

- ❏ open monthly meetings with active public participation;
- ❏ a June 9, 1994, public workshop on the FutureSite exercise;
- ❏ a January 25, 1995, public workshop on waste disposal options;
- ❏ presentations at the February 1994, June 1994, October 1994, and March 1995 DOE community meetings;
- ❏ face-to-face meetings between Task Force members and other stakeholder groups;
- ❏ attendance by members and staff at all DOE public meetings and workshops;
- ❏ a Task Force mailing address and message line for public comment;
- ❏ disseminating information through community channels;
- ❏ news releases; and
- ❏ advertisement of all Task Force meetings in local papers.

A summary of public comments received by the Task Force is presented in Appendix D, "Summary of Public Comments."



IV. TASK FORCE DECISION-MAKING PROCESS

Goal Setting and Planning

Focusing on a discrete set of goals was a key component of the Task Force's strategy. Each of the four requested recommendations outlined in the Task Force charter was identified as a discrete end point of the Task Force process. Identifying these goals and creating an understanding of the activities required to achieve them was the basis for a detailed work plan developed to identify the purpose of each meeting and how it fit into the full eighteen-month decision-making scheme. Particular focus was placed on identifying specific questions to be addressed during each meeting, the information to be evaluated, and the expected outcome of each meeting. Clearly identifying this path forward assisted the Task Force in avoiding the burn-out that often occurs in a long-term process when little early progress is apparent.

Developing and Disseminating Information

When the Task Force was established in August 1993, site investigations had been underway for several years. The Task Force was well behind in its level of knowledge about site characteristics and remediation alternatives. To catch up, the Task Force decided to use the first six months of 1994 as an intensive learning period. While necessary, this approach presented two distinct challenges:

1) in a short period of time, how to present large volumes of detailed technical information to a group of individuals of various backgrounds and experiences; and

2) how to maintain the group's interest over a period of months when little tangible action or progress would be perceived.

These challenges were met by approaching the group as executive decision makers, focusing on the decisions that had to be made, rather than attempting to gain an understanding of all the site information available. Presenting all of the information available would have resulted in information overload and would have paralyzed the process.

The Task Force chair and the consultant collaborated to identify the information that was critical to decisions. These information needs were incorporated into the work plan, after discussion and amendment by the entire group. In this way, the group understood what was to be presented and discussed at each meeting.

It was important for the Task Force members to overcome their own individual preconceptions about the site and remediation options, so that the group could approach its challenges as objectively as possible. To achieve this, information had to be accurate, unbiased, and presented in an understandable and useful form. Gathering and presenting information was the principal responsibility of the Task Force consultant. Developing new site information was simply not practical. However, the formats of existing information often did not fit the Task Force's needs. The Task Force consultant identified the group's information needs and worked closely with DOE and the site contractor to obtain information. The Task Force consultant then created formats for use by the Task Force to portray the information in the most effective manner for decision making. Once the chair and the consultant were confident that the information was accurate and useful to the Task Force, it was formally included in Task Force materials and a Task Force logo affixed. Other less critical information was used if necessary, but not placed in formal Task Force format. Finally, the Task Force consultant presented the information to the Task Force, explained its origin, and described its relevance to Task Force activities.

It was important to Task Force members that the Task Force consultant evaluate the validity of all information presented to the Task Force. Early in the process, there was a great deal of mistrust in information provided by DOE. However, the role of the consultant and the openness of DOE, FERMCO, USEPA, and OEPA throughout the process alleviated this mistrust over time. The unprecedented access given to the Task Force sometimes resulted in newly generated information being made available to the Task Force. In a few cases, key pieces of information changed over the course of Task Force deliberations. Rather than create further mistrust, however, these changes were promptly identified, the

reasons for the changes explained, and the revised information incorporated into the decision process. As a result, the level of trust in this information remained high. Indeed, information and formats developed first for the Task Force were often used later by DOE, FERMCO, USEPA, and OEPA, bolstering its validity.

Posters were made of tables, charts, and figures to allow the entire group to work together during Task Force meetings. A cornerstone of each meeting was also an "information bin" which was used to record important questions and issues not yet addressed by existing information. These questions were answered as part of the information for the following meeting.

About halfway through its decision-making process, the Task Force found that it was requesting information and considering issues that had yet to be contemplated on-site. In several instances, Task Force questions led site decision makers to create information in new and useful ways that benefited not only Task Force members, but site managers as well.

Decision-Making Approach

Early in the process, Task Force members realized that remediation decisions could not be made until some vision of the future use of the Fernald property was established. Therefore, the charter mandate to evaluate future use of land and natural resources at the Fernald site became the first order of business for the Task Force. The approach designed into the Task Force work plan used the future use question as the foundation upon which all other recommendations would be built.

The Task Force began by identifying a broad range of plausible uses for the Fernald site following remediation. Next, the Task Force identified all issues and concerns that were important to consider in evaluating options for the future of Fernald. These issues were refined and incorporated into a set of consensus values for the future use of Fernald, which are presented in Figure 5. These consensus values were used throughout the decision-making process to provide guidance for developing and evaluating alternative recommendations. These values were distilled into the following discrete criteria, which were useful in comparing alternatives to the issues important to the Task Force:

Figure 5. Task Force Consensus Values

ENVIRONMENTAL VALUES

- Identify and preserve significant natural ecosystems with a special emphasis on naturally occurring wetlands, Paddys Run, and threatened and endangered species.
- Minimize impacts on the environment during remediation and maximize restoration of environment after remediation.
- Ensure that any waste left on-site be controlled to prevent further contamination of the Great Miami Aquifer, air and soils on and off-site.
- Any future site use must be protective of the environment.

SOCIAL AND HUMAN VALUES

Future uses must have a positive impact on the surrounding communities, including:

- Acceptable risks to the current and future residents and workers of the Fernald community with a special emphasis on the effects on children and future generations.
- Input and involvement from the public at large.
- Compatible with current and projected off-site uses.
- Special emphasis on promoting history, research, and education.
- Demonstrating how a negative situation can be turned into a positive by not repeating the mistakes of the past which resulted in the current conditions at Fernald.

ECONOMIC VALUES

- Emphasis should be placed on future uses which provide some level of continuing employment for area residents, but not necessarily in categories that have traditionally been present at the site.
- Futures uses and ownership should be structured so that local tax revenues or payments in lieu of taxes are provided.
- Where practical, infrastructure should be used to enhance the suitability of the property for future use subject to environmental and health values.
- The cleanup of the Fernald facility should be done in such a way as to reduce the stigma of past practices at the site and assist in the continuing use and development of surrounding properties.

LONG TERM MANAGEMENT VALUES

- A long-term control mechanism for the site must be established to ensure the perpetual moral and financial responsibility of the Federal government for the continued management, monitoring, and emergency response capability regarding all wastes left on the facility.
- Long-term uses and institutional control mechanisms must be reconciled with local zoning and planning.
- All uses resulting in waste being left on site must have the built in flexibility to provide for future changes in use and better cleanups should financial, technical, or demographic changes warrant.
- A long-term mechanism must be established to ensure citizen involvement in the control, management, and future decisions at the site

GENERAL USE VALUES

- Any future use plan must recognize that a mixed use strategy may be the most effective for the long-term use of the site.
- Emphasis should be placed on reducing the physical barriers and physical evidence of the past use of the site and focus on ways that Fernald can be a better neighbor to the surrounding community
- Under no circumstances should a post-remediation future use be permitted at the facility which requires the importing of hazardous, radioactive, mixed or solid waste for any reason.
- All uses and cleanup plans for all waste, shipments, and treatments must explicitly recognize all political, safety and health impacts.
- Future uses of the site must be focused on non-hazardous activities.

Long-Term Safety: Effectiveness of available technologies over time, and long-term monitoring and ownership of the Fernald property are seen as crucial to the long-term acceptability of any remediation scenario.

Short-Term Risks: Risks to workers and residents resulting from the remediation activities themselves are of paramount concern.

On-Site Disposal Requirements: The volume of soil that will be excavated and the ultimate size of any on-site disposal facility will greatly determine the overall impact of the remediation on local communities during and after construction.

Impact on Natural Resources: Excavation of the large quantities of contaminated soil present at Fernald will have a significant impact on the flora, fauna, sensitive habitats, farmlands, and wetlands that comprise the Fernald site and surrounding properties.

Transportation and Off-Site Disposal Requirements: The Task Force is sensitive to the impacts on and potential risks to communities along transportation routes and at the ultimate disposal facility.

Community Impacts and Benefits: Disruption of adjacent lands and the long-term economic, social, and aesthetic impacts on local communities and Fernald work force are likewise of significant importance.

Cost: As a taxpayer-funded project, the total cost of remediation is important. While Task Force members repeatedly expressed unwillingness to trade lives for dollars, the Task Force recognized DOE budget projections indicate real limitations on available resources in the future.

By constantly weighing the pros and cons of alternatives as they related to these criteria, the Task Force members narrowed options and ultimately reached consensus. The Task Force did not use any formal quantitative models to conduct these analyses, and, other than overall health and safety, no one criterion ranked more importantly than another. Instead, a number of tools were developed to help to create a complete understanding of the opportuni-

ties, constraints, risks, costs, and benefits associated with alternative approaches to remediation.

While final decisions were made using a parliamentary process, consensus decisions were sought and preferred by the Task Force. Using language and supporting arguments developed by the entire group, the Task Force chair and consultant prepared formal recommendations between Task Force meetings and circulated drafts for review. This allowed all members to fully consider the ramifications of the recommendation and enabled absent members to evaluate recommendations before final discussions. Additional discussion and amendments were conducted at subsequent meetings before final recommendations were brought to a vote. An important part of this process was providing for expression, discussion, and inclusion of diverse and minority positions. This process resulted in consensus principles being used to develop all decisions before final voting.

Decision-Making Tools

The main tool used by the Task Force was a system of organizing and presenting information in a three-ring binder for each member. This binder was referred to as the "Tool Box," and it was organized by topics for easy reference and focus on specific questions. The concept was to present information in a simple and clear manner. Information regarding each decision was broken into discrete pieces and organized to focus on key aspects of alternatives. The Tool Box system was designed to present most concepts on a single sheet of paper, making frequent use of charts, graphs, maps, tables, and color. Rarely were more than two or three pages used to present a discrete piece of information.

The Tool Box was developed and organized to provide the knowledge needed to understand the risk presented by the Fernald site and the various costs and benefits of the alternatives the Task Force wished to consider. Key information in the Tool Box included:

- ❑ physical and chemical characteristics of Fernald and surrounding lands;
- ❑ current land and natural resource uses; and
- ❑ information on risk and risk analysis, alternative remediation levels, waste management options, and detailed descriptions of alternative future use scenarios.

The future use descriptions were supplemented by charts and maps showing volume, cost, disposal cell size, and off-site transportation requirements for different future use alternatives. Also included were color-coded maps that identified the scope and depth of soil excavation required for each alternative. In some cases, information available in existing site documents was modified by the Task Force consultant for use by the Task Force. In other cases, the Task Force consultant worked directly with DOE and FERMCO to identify and develop new information. Selected figures and tables from the Tool Box have been used as figures in this report and additional examples are included in Appendix E, "Key Elements of the Task Force Tool Box."

Another decision-making tool developed for the Task Force was an exercise called FutureSite. FutureSite is a three-dimensional representation of contamination at the Fernald site designed to show how achieving different levels of land use impact the cost and volume requirements for remediation. A large site map was divided into a grid, with each square containing a stack of colored chips representing the actual volumes of contaminated soil and materials found at that site location. By removing different color chips from the board, participants could visualize the volumes of contaminated material that would have to be moved to achieve different land uses. Less restrictive land uses for the site required participants to remove more material from the board. Participants could choose between on-site or off-site disposal for this material. Associated costs and requirements were then applied to calculate total volumes and costs of the selected option, truck and train transport requirements, and the size of on-site disposal facilities. A description of the FutureSite exercise is included in Appendix F, "Overview of FutureSite Exercise."

FutureSite was instrumental to Task Force members' understanding of the waste disposition and remediation level decisions. The Task Force ran the exercise twice, each time separating into several smaller independent groups. In this manner, several remediation and future use scenarios were developed which could be compared and evaluated. Analysis of these scenarios was the first step in reaching consensus on future use and remediation levels. In addition, the exercise was used widely by DOE and FERMCO and helped shape and widen understanding of the site.

Another tool used frequently in the Task Force decision-making process was a magnetic white board portraying the site and major attributes of site remediation problems. The Task Force

used magnetic blocks, erasable markers, and clear overlays to portray and compare remedial options. This board allowed the Task Force to physically portray and work through the many options available regarding future use partitioning of the site, levels of remediation across the site, impacts of remediation, and the size and location of on-site disposal facilities. These tools, combined with the Tool Box, provided the means for Task Force decision making.

V. TASK FORCE RECOMMENDATIONS

All recommendations in this report have been previously reported to DOE, EPA, OEPA, and the public in order to make the most immediate impact on the decision-making process. The first recommendations on remediation levels and preliminary future use were presented in November 1994 in an Interim Report which also described the decision-making process. Subsequent recommendations on waste disposition, priorities, and final future use were developed and released as fact sheets in February, April, and May 1995.

The Task Force recognizes that it was charged with providing recommendations only, and is not in a position to make actual decisions. However, the Task Force approached these recommendations as decision makers to ensure reasonable and meaningful recommendations. Most important, the SSAB approach allowed a diverse group of people to come together to recommend a common approach to remediation. Coming into this process, Task Force members all had very different expectations and preferences regarding the remediation of Fernald. Many months of hard work enabled the Task Force to develop recommendations based on a common vision for Fernald, the result of a process that focused on ideas, rather than individual preferences.

These recommendations are also the result of the Task Force's careful and thorough consideration of important health, social, economic, and political constraints, and of the consequences of remediation of the Fernald site. These recommendations do not represent a negotiating position; rather, they represent the Task Force's best effort to develop a reasonable, balanced approach to Fernald site remediation. The Task Force believes that these recommendations, if taken in total, will provide remediation of the Fernald site in a manner which protects human health and the

environment, maintains the integrity of the surrounding communities, and avoids unnecessary expense.

The specific recommendations of the Task Force are presented in a different typeface than the rest of the report, indicating consensus language of the Task Force. Supporting information includes a summary of each recommendation and an overview of the issues that were evaluated in developing the recommendations. Except as noted, all recommendations were unanimously agreed to by members of the Task Force.

Recommendations On Site Remediation Levels

Summary

The recommendations on remediation levels for soil and groundwater were presented in the Task Force's November 1995 Interim Report. The Task Force identified specific remediation levels based on total uranium in soil and groundwater as these comprise the bulk of the contamination at Fernald. In establishing these remediation levels, the Task Force was most concerned with protection of the Great Miami Aquifer and consistent protection of human health across all potential **exposure pathways** and land uses. The Task Force sought to balance the absolute requirement of protecting human health with the desire to minimize impact on the environment and surrounding communities resulting from the remediation itself.

To remediate properties surrounding Fernald to background levels of contamination would require surface soil excavation for 5 miles surrounding the site, a consequence the Task Force found unacceptable. Ultimately, the Task Force arrived at recommended remediation levels which were protective of human health and the environment and which require little off-site excavation. These levels were based on:

1) restoring and protecting the aquifer to conform with **maximum contaminant levels (MCLs)** for all contaminants under the Safe Drinking Water Act;

2) reducing the excess risk of cancer during an individual's lifetime to one in 10,000 ($\mathbf{1x10^{-4}}$), and;

3) reducing non-cancer risks to a level at or below the EPA target for **hazard index** of one.

Detailed Recommendations for Groundwater

- **Past impacts of the Fernald site on the Great Miami Aquifer must be remediated and any future impacts controlled so that groundwater quality meets the standards of the Safe Drinking Water Act. The corresponding MCL for uranium is currently proposed at 20 ppb, which is equivalent to a risk of 2 in 100,000 ($2x10^{-5}$).**

Key Issues Evaluated for Groundwater

Because protection of the aquifer was one of its consensus values, the Task Force took an in-depth look at the options for dealing with groundwater contamination. The Task Force evaluated three distinct endpoints:

1) remediating to the **$1x10^{-6}$** drinking water risk, which is 3 **parts per billion (ppb)** for uranium;

2) remediating to the EPA maximum contaminant level (MCL), which is currently proposed at 20 ppb for uranium (equivalent to a risk of $2x10^{-5}$); and

3) not remediating at all but allowing the aquifer to flush itself over time.

Comparing these alternatives, the Task Force evaluated a wide range of issues. Due to the prevailing groundwater flow through the Fernald site, all contamination would ultimately reach the Great Miami River, where the volume of water would dilute the contamination to low levels. The primary threat of the contamination to drinking water sources has been largely checked by DOE, which has provided bottled water to affected homeowners and has partially funded the expansion of the public water system to area residents.

On the surface, dilution appeared to be a viable approach to dealing with groundwater contamination. However, if left unchecked, as much as 4,000 surface acres, corresponding to 32 billion gallons of water, would ultimately be impacted according to current projections. The result would be condemnation of the aquifer beneath those 4,000 acres for many generations. The Task Force views the social, environmental, and potential legal and administrative costs of such an approach as unacceptable.

The Task Force also evaluated measures to contain the contaminated groundwater within the Fernald site boundaries. The current pumping wells appear to have successfully stopped migration of the south groundwater contamination plume. However, any such interim or containment measure would only result in the need for virtually perpetual action, due to the long half-life of uranium. Thus, interim or containment measures would require repeated replacement of water treatment facilities at the end of their useful lives, approximately every 30 to 40 years.

With the constant risk of losing funding for new construction activities, the Task Force was unwilling to take such an approach. Ultimately, such an approach would result in higher costs than for a total and rapid remediation today. Decisive action now will enable remediation to MCLs within the life span of a single treatment plant.

The Task Force concluded that Fernald's impact on the Great Miami Aquifer is a significant concern, and the only viable action is to seek complete and rapid remediation. The Task Force opted to recommend remediation of the aquifer to meet MCLs. The use of MCLs is widely accepted for groundwater remediation. MCLs are designed to be protective of human health and the environment, and MCLs are technologically and practically achievable.

The Task Force believes remediation of the aquifer to $1x10^{-6}$ levels is not technologically and practically achievable. Seeking this level would likely result in great expense to capture relatively little additional contamination, would require much longer periods of time to achieve results, and would offer little ultimate benefit in the overall protection of human health and the environment.

Detailed Recommendations for Soils

- **The excess risk of contracting cancer posed by exposure to Fernald contamination under any use of land, on or off the Fernald property, shall never exceed one in ten thousand ($1x10^{-4}$). This is a maximum level; the other recommendations of the Task Force regarding aquifer protection and hazard index override this risk level to make remediation more stringent. Additionally, the Task Force recommends limiting land use even in cases where the**

concentrations achieved in the soil would allow for less restrictive uses, to provide for an additional margin of safety.

- **All contaminated soils and other waste sources both on and off the Fernald property must be reduced to levels that will provide safety from non-cancer toxicological effects at a level at or below a hazard index of one.**

- **All contaminated soils and other waste sources both on and off the Fernald property must be reduced to levels that will prevent contaminants from leaching into the aquifer at concentrations exceeding Safe Drinking Water Act levels.**

Key Issues Evaluated for Soils

In looking at remediation levels for soils, the Task Force evaluated the range of risks considered acceptable by EPA for Superfund remediation of $1x10^{-4}$ (1 in 10,000) to $1x10^{-6}$ (1 in 1,000,000) excess chance of contracting cancer in a lifetime. The Task Force evaluated this range of risks across a broad spectrum of land uses in evaluating the overall level of remediation that should be required at Fernald.

Evaluating the impacts of applying different **levels of acceptable risk** across different land uses allowed the Task Force to compare numerous factors including total soil volumes requiring excavation; off-site disposal requirements; on-site disposal requirements and disposal cell size; total cost; environmental impacts; and technical, legal, economic, and social implementability.

The most striking concern in making this decision was the volume of soil that would require excavation beyond the Fernald property boundary if a $1x10^{-6}$ residential scenario were chosen. At this risk level, a total of 5,200,000 cubic yards of soil would be removed from off property alone. Disposal of this amount of material combined with the on-site volumes, would require a disposal cell of approximately 400 acres, and approximately 430,000 truckloads or 1,350 trainloads for off-site shipment.

The Task Force is also concerned about the serious ecological damage that would occur from widespread excavation. At the $1x10^{-6}$ remediation levels, the required excavation would rob 11

square miles of surrounding homes and farmlands of vital top soil, mature trees, and vegetation, and would cause enormous disruption to lives and livelihoods during construction. Though ultimately the top soil would be replaced and vegetation replanted, it would be generations before the ecosystems fully recovered. The short-term risks to current residents and workers due to disturbance and resuspension of contamination in the air and construction accidents far outweigh the very small reductions in long-term risk that would be achieved. Moreover, because the 5 ppm remediation level for resident farmer at $1x10^{-6}$ is so close to background levels of uranium of 3.7 ppm, it would be difficult even to distinguish where this contamination occurs. Finally, it is important to the Task Force that risk criteria be consistently applied across the site and $1x10^{-6}$ was rejected as an option for groundwater remediation.

The Task Force carefully examined the levels of contamination that have actually been found off the Fernald property. Several interim remediation ("**removal**") actions and the tilling action of farming on much of the off property land has resulted in eliminating much of the detectable contamination. In all cases, the contamination is well below the remediation requirements to protect for a resident farmer exposure at $1x10^{-4}$ (130 ppm), and only marginally above the resident farmer requirements at $1x10^{-5}$ (15 ppm). Approaching background (3.7 ppm), uncertainty would require high volumes of soil removal. Considering the existing low levels of contamination found off the Fernald property and the desire to limit the disruption of off-site homes and farms, the Task Force decided on a maximum residual risk from Fernald soils of $1x10^{-4}$.

The Task Force selected the $1x10^{-4}$ risk, however, with the full understanding that uranium concentrations in soil necessary to meet the goal of fully protecting the aquifer to MCLs over the long term are even more stringent. At most locations both on and off the Fernald property, a total uranium concentration of 100 ppm is required to prevent leaching into the aquifer above the currently proposed MCLs for uranium, which is lower than the 130 ppm concentration necessary for a resident farmer exposure scenario at $1x10^{-4}$. Further, as a result of the high solubility of uranium found in the former production and sewage treatment areas, the uranium concentration required to protect the aquifer in these areas is 20 ppm.

The Task Force's commitment to safe remediation levels requires the consideration of toxicological impacts in addition to

cancer. For uranium in a resident farmer scenario this requires remediation to 50 ppm so as not to exceed a hazard index of one. Taking this approach, the Task Force has deliberately provided a level of protection above the stated risk maximum. This 50 ppm concentration would apply at all off-property locations, but not on the Fernald property, as the Task Force does not recommend allowing such intensive uses of Fernald. However, sampling results to date indicate that there are actually few places outside the former production area where concentrations exceed 50 ppm.

To summarize, the specific remediation levels for total uranium in soils recommended by the Task Force for the Fernald facility are as follows:

- ❏ 20 ppm within the former production and sewage treatment areas,
- ❏ 100 ppm within all other points on the Fernald property,
- ❏ 50 ppm for all locations off the Fernald property.

The Task Force understands that, for the most part, remediation of total uranium to the levels recommended will result in the excavation and safe disposal of all of the contaminants of concern found at the Fernald site. There will be exceptions, however, and the general remediation criteria apply to them:

- ❏ cancer risks not to exceed $1x10^{-4}$,
- ❏ protection of aquifer to MCLs,
- ❏ non-cancer risks not to exceed hazard index of one.

One Task Force member expressed concern that the Task Force began and concluded its work without the benefit of objective evidence of human health risks. This member believes that the risks, as presented to the Task Force, are not sufficiently established. Further, it has been suggested by other sources that EPA-proposed guidelines, EPA Maximum Contaminant Levels, and other measures supplied to the Task Force, are rooted in arbitrary extrapolation of decades old, massive dose tests on laboratory animals, rather than empirical human long-term disease analysis. All Task Force members accept that certain radionuclides can cause disease, but this member is uncertain which types and how much exposure to humans is really acceptable. Therefore, this Task Force member questions whether the true risk is much lower than the Task Force's presumptions and whether the cost of the remediation is substantially excessive.

Recommendations on Waste Disposition

Summary

The Fernald Citizens Task Force evaluated the political and logistical considerations involved in disposing over 3 million cubic yards of contaminated material and determined that a balanced approach, in which some waste was disposed on-site and some was disposed off-site, was most prudent.

Of paramount importance was that the highest-level wastes be taken off-site for safe disposal and that no new wastes to come to Fernald for disposal. Therefore, the Task Force concurred with existing DOE decisions that the most highly contaminated materials to be disposed off-site. The Task Force recommended that an on-site disposal facility be constructed to store materials with low levels of contamination from only the Fernald site. One Task Force member, Darryl Huff, objected to this recommendation, preferring that all contaminated material be removed from Fernald and disposed off-site.

Detailed Recommendations

The Fernald Citizens Task Force recommends the construction of an on-site disposal facility to accept, from the Fernald site only, materials solely with low levels of contamination meeting the site-specific waste acceptance criteria. However, on-site storage of low-level materials at Fernald is acceptable only in the context of the considerations laid out in the following section and under the following conditions, such considerations and conditions being inseparable from the recommendation:

The Fernald Citizens Task Force recommends the construction of an on-site disposal facility to accept, from the Fernald site only, materials solely with low levels of contamination meeting the site-specific waste acceptance criteria. However, on-site storage of low-level materials at Fernald is acceptable only in the context of the considerations laid out in the following section and under the following conditions, such considerations and conditions being inseparable from the recommendation:

- **The Fernald Citizens Task Force strongly and unanimously opposes the use of the Fernald site for the permanent disposal or long-term storage of any waste or contaminated materials originating from other locations.**

- **Any on-site disposal facility will be built for long-term performance using the best design, technology, and engineering available.**

- **Any on-site disposal facility at Fernald will be designed to make the least possible negative aesthetic impact. The Fernald Citizens Task Force and the public at large shall be explicitly involved in the process for determining the ultimate appearance of the disposal facility.**

- **Any on-site disposal facility at Fernald will provide an adequate buffer area to minimize negative impacts to neighboring properties and the future use of the Fernald property. The Fernald Citizens Task Force and the public at large shall be explicitly involved in the planning and design process for the disposal facility.**

- **The U.S. federal government will retain permanent ownership of any property containing the disposal facility.**

- **The U.S. federal government will continually monitor the disposal facility and report these findings in a timely manner to residents and interested parties.**

- **The U.S. federal government will commit to retrieve and treat or redispose of the material contained in the disposal facility if a new, proven, and economically justified technology to manage these materials should become available.**

- **The U.S. federal government shall have in place adequate procedures to identify and correct any and all failures in performance of the disposal facility before any increased risk to public health occurs.**

- **The U.S. Department of Energy commits to the above conditions.**

- **U.S. Department of Energy budget adjustments in the short or long term will not adversely impact the substance of this recommendation.**

Key Issues Evaluated

Waste disposition was the most difficult decision faced by the Fernald Citizens Task Force and the only one in which complete consensus could not be achieved. The Task Force spent a great deal of time collecting and evaluating data regarding the ramifications of on-site *vs.* off-site disposal. A great deal of time was also spent in working with other local stakeholders through meetings and workshops. The evaluation of disposal options actually began with the FutureSite exercise, when it first became evident how many trucks or trains would be required to haul the millions of cubic yards of material off-site. It was this realization, combined with the associated short-term risks of transportation, that most members found most compelling in recommending on-site disposal.

Another compelling reason was the desire to get the most hazardous materials off-site as soon as possible. A balanced approach in which DOE, EPA, and OEPA showed willingness to manage at least part of the waste on-site was seen as the most prudent in achieving this goal. It was strongly believed that exhibiting an unwillingness to deal with part of the problem at Fernald would result in political consequences with the states which are to receive Fernald waste, resulting in the inability to get any waste sent off-site. Additionally, most Task Force members were sensitive to the safety concerns of other citizens living along transportation routes and in the vicinity of the receiving facilities.

The need to explain the rationale for the decision to select partial on-site disposal was strong enough to make the considerations for the recommendation itself. These considerations are presented in the following paragraphs.

All Task Force members live or work in communities impacted by the decisions being made at Fernald, and 8 of 14 live or work in the direct vicinity of the site. No Task Force member wishes to see contaminated materials from Fernald or any other

location stored on the Fernald property indefinitely. Because it adjoins residential and agricultural lands and is situated directly above a sole-source aquifer, Fernald is not an ideal location for disposal of contaminated materials. Nevertheless, the Task Force is aware of the many engineering, political, and financial challenges facing a project the size of the Fernald remediation. The Task Force's primary goals are protecting human health and the Great Miami Aquifer. The Task Force believes that a balanced approach to remediation, in which the most hazardous materials are disposed off the Fernald property and the least hazardous materials are stored safely on the property, will result in prompt, enduring protection for the local communities. The Task Force ultimately arrived at this recommendation in consideration of the following issues, the understanding of which is critical to the entire recommendation:

- ❏ The sooner source materials are taken out of the environment, the better the aquifer is protected and the sooner it can be restored. The Fernald Citizens Task Force believes an on-site disposal facility is the quickest way to protect the aquifer and the overall environment.

- ❏ The hazard associated with the materials to be placed in the on-site disposal facility is very low. The maximum level of contamination to be allowed in the disposal facility would allow for a land use as a developed park under remediation levels recommended by the Task Force. The materials are to be contained in a disposal facility solely for the purpose of long-term protection of the aquifer. Failure of the disposal facility would not present any immediate or significant threat to human health.

- ❏ In the off-site option, the risk of transporting the expected 2.4 million cubic yards of low-level contaminated soil and debris from the Fernald site to Utah and/or Nevada includes a probability of six fatalities within the public along the transportation routes, while relatively little health and safety risk is incurred by the public under the on-site option. Both on- and off-site options require similar levels of work in excavating, loading, unloading, and disposing of materials; therefore, the risk to remediation workers in both options is roughly equivalent. The Fernald Citizens Task Force believes the on-site option is the most responsible with regard to overall safety.

- The cost of off-site disposal is three times that of on-site disposal. The Fernald Citizens Task Force believes that under current and foreseeable budget conditions, an off-site decision would greatly delay remediation and may prevent any progress. An on-site disposal facility is more viable under the current budget and political constraints.

- Both Utah and Nevada have written to Fernald, encouraging a balanced approach to remediation. The Fernald Citizens Task Force is concerned that if the decision were made to send all Fernald waste and contaminated materials off-site, Fernald would face the likelihood of reprisals from other states resulting in its inability to send any waste off-site. The Fernald Citizens Task Force believes it is of paramount importance for off-site shipment of the most hazardous materials to be the first priority of remediation, and it should be carried out expeditiously.

- Because the entire Fernald property is situated over a sole-source aquifer, only the lowest-level materials, as defined by the site-specific waste acceptance criteria, will be allowed into an on-site disposal facility. The **waste acceptance criteria** for Fernald were established by modeling the proposed disposal facility over a 1,000-year period to prevent any contamination at levels that would exceed the federal maximum levels of contamination for drinking water from reaching the aquifer. This modeling assumed only natural materials would be used in providing protection of the aquifer and excluded consideration of man-made liners that are subject to failure over the 1,000-year period.

- The Fernald Citizens Task Force wants to prevent any waste or contaminated materials from coming to Fernald from other sites for permanent disposal or long-term storage. Under the Federal Facilities Compliance Act of 1992, that potential exists. By managing the Fernald materials fairly and effectively, the Fernald Citizens Task Force believes Fernald will be in a more equitable position to prevent a decision to send outside wastes to Fernald.

The decision regarding waste disposition was highly controversial. A vocal public emerged which opposed any on-site disposal of contaminated material. To hear and evaluate fully all points of view, the Task Force spent a great deal of time on this

decision. The Task Force provided extra publicity for meetings, met with community members, and conducted a special workshop to present the information and materials being used in the decision-making process. While ultimately the supporting considerations and conditions were approved unanimously, one Task Force member, Darryl Huff, was unable to support the decision to place a disposal facility at Fernald. He believed that the arguments for on-site storage of materials containing low-level contamination were outweighed by the following:

- ❑ The contamination problems at Fernald did not evolve from local concerns or result in sufficient local benefit to warrant the long-term impact that the presence of a disposal facility would have on local communities.
- ❑ Facilities in the western U.S. are geologically better suited for the long-term management of this material.
- ❑ Local communities do not wish to incur the stigma associated with a disposal facility.
- ❑ A disposal facility on the Fernald property limits the land available for productive reuse by local communities.

Recommendations on Priorities for Remediation

Summary

The Fernald Citizens Task Force recommends that Fernald adopt an accelerated remediation schedule to provide rapid protection of human health and the environment, and to control overall costs. The recommendation calls for DOE to focus on remediation by reducing non-remediation costs as quickly as possible and to eliminate redundant requirements. Specific sequencing of activities within that accelerated schedule was viewed to be less important. However, the Task Force makes specific recommendations for higher risk wastes awaiting shipment to be removed from the site immediately.

Detailed Recommendations

As part of our charge to recommend site priorities, we are calling for a fundamental shift in the approach to remedial operations at Fernald. DOE and its contractor must view the project as an environmental remediation operation. It is their job to implement the remediation decisions that have been made, quickly, safely, and cost-effectively – and then to leave. If Fernald is to be really treated like the remediation project it is – where work should be focused on a single goal and completed in a finite period of time – management at all levels must make an immediate and decisive change. Such an approach has several important consequences for remedial priorities, and focuses attention on obstacles to remediation apart from the existing operable units. Its cornerstone must be to eliminate big sources of non-productive expense: high overhead, storage of materials awaiting shipment, and cumbersome Department of Energy requirements. Specifically, we would like to see immediate and substantial steps taken to deal with the following:

Special Nuclear Materials. There are 17 million pounds of special nuclear (non-waste) materials throughout the Fernald site, which require a high level of expensive security, accounting, and safety procedures to maintain. This material is not going to stay at Fernald. This material does not belong at Fernald now, as Fernald is an environmental remediation project. Storage and maintenance of this material is being done at the expense of remediation operations. Appropriate storage facilities already exist within the DOE complex for materials such as these. The Secretary of Energy and the Assistant Secretary for Environmental Management must ensure that DOE make and implement the decision immediately to move these materials to such an appropriate location.

Legacy Wastes. There are approximately 70,000 drum equivalents of legacy waste sitting at Fernald awaiting shipment and another 12,000 drum equivalents of mixed waste awaiting treatment and shipment. Again, the storage and maintenance of these wastes is diverting money from other much needed remediation activities. There is no mystery surrounding the location for disposal of most of these wastes, and their immediate shipment should be a top priority.

Safe Shutdown. When production ceased at the plant in the summer of 1989, it was conducted without taking the proper steps to bring the equipment and buildings to a safe configuration. As a result, millions are spent each year to maintain and provide security to buildings that should be closed and shuttered for subsequent demolition. Every effort must be made to expedite the safe shutdown of the Fernald facility to eliminate these burdensome overhead costs and hasten the shift in culture from operations to environmental remediation.

Ongoing Maintenance Activities. Another aspect of approaching Fernald as a remediation project is to discontinue the ongoing repair, maintenance, and improvement to on-site buildings and infrastructure, except where essential to remediation progress or worker safety.

Overlapping Requirements. Perhaps the most cumbersome of all requirements facing the remediation of the Fernald site are those internally imposed by DOE on itself. Significant time and money is wasted by requiring remediation activities to comply with DOE orders that are geared to the operation of highly complex and dangerous nuclear operations. Where these orders are superfluous or are redundant of other state and federal regulations, DOE can and should waive them. The Fernald Citizens Task Force recommends that the Fernald site be the prototype for streamlining these requirements and placing remediation first.

Budgeting for the Long Haul. Fernald holds a unique position among DOE's major remediation-sites: its decision making is nearly complete, needed technologies are in place, and its size is manageable. With the above reforms, a relatively modest up-front investment will yield a nearly complete remediation in one-half to one-third of the time projected in current reduced-budget scenarios. Under current budget constraints, remediation is estimated to take 25 years at a total **escalated cost** of $5.7 billion. Without constraints, the same remediation could be conducted in approximately 10 years at a total escalated cost of $2.9 billion. In addition to saving billions of dollars, the symbolic significance of getting a

major facility "off the books" is incalculable. Our understanding of the options available to DOE in budgeting the Fernald project boil down to two basic choices: the potential for a big win by completing remediation in the 10 year time-frame or a project constrained by annual funding caps that eventually costs twice as much and lasts three times as long. Dollar for dollar, there must be few opportunities in the DOE complex that offer a clearer choice or more attractive dividends.

There exists at this time at Fernald a window of opportunity to efficiently select and implement an accelerated remediation. DOE, its regulators, and its stakeholders must work together, with flexibility on all sides, to make these changes happen. It is time that DOE changed its legacy to a model of government/ contractor efficiency. Given the tools *and the reforms*, Fernald can lead the way.

Key Issues Evaluated

Originally, Task Force priority recommendations were envisioned as a sequencing of specific remedial activities according to their importance to the concerns and goals of stakeholders. However, as dramatic cuts in the DOE budget began to occur, the nature of the problem shifted. Suddenly, the Task Force was faced with remediation time frames stretching to 25 years at total costs of twice what was expected within projected annual budgets.

The most important aspects of site remediation for the Task Force were to remove the highest-level contaminants from the site as quickly as possible and to conduct remediation as safely and cost-effectively as possible. That combination left the most rapid remediation as the only viable alternative. Therefore, the focus of prioritization became how to obtain funds necessary to conduct overall remediation as quickly as possible in as the safest, most cost-efficient manner possible. The approximately 10-year schedule recommended by the Task Force would provide for the total management of all source materials, and leave aquifer restoration and long-term monitoring as the only site activities required after that time.

Recommendations on Future Use

Summary

The Fernald Citizens Task Force focused its future use recommendations on creating a broad understanding of how the Fernald site could best be used after remediation, rather than identifying specific detailed ideas for future use of the property. The Task Force recommended that residential and agricultural uses of the property be avoided. However, it was also important to the Task Force that the land be used productively. For this reason, the remediation levels recommended for the site provide for all uses other than residential or agricultural. The Task Force also recommended that a sufficient buffer be provided between the on-site disposal cell and any other uses of the property. Ultimately, the Task Force recommended that, within the guidelines set forth, specific uses of the property would be best determined closer to the time of reuse by the people most impacted by that use.

Detailed Recommendations

Conceptually, The Task Force has divided the Fernald property into three zones: 1) the land containing the proposed on-site disposal cell and supporting facilities, 2) a transition zone surrounding the cell on all sides, and 3) all remaining property at Fernald. In support of this concept, the following recommendations have been developed:

- **The on-site disposal facility (zone one) should be tied into the natural environment to the greatest extent possible consistent with public health and safety. This includes a natural vegetative cover of native plants, and gentle slopes keyed into natural contours of surrounding land. Extensive public input into facility design is anticipated to ensure that the visual impact of the facility on surrounding properties is minimal.**

- **It will be important to isolate the disposal facility from public access. This isolation is required to protect the cover system of the disposal facility and not because the facility poses any direct exposure risks to individuals in the area. The barriers to prevent access should be as unobtrusive as possible, while still providing clear markings and protection from intrusion.**

The Task Force prefers combining man-made barriers with natural barriers to soften the visual impact and to blend in with the total surroundings.

- **To limit temptation for trespassing on the cell property and to provide for a natural transition in uses, the land immediately surrounding the cell and supporting facilities (zone two) should have limited use. Therefore, the Fernald Citizens Task Force recommends that a minimum of 300 feet in each direction of the cell property be reserved for limited use. These uses may include undeveloped green space and natural habitats, and public access should be clearly discouraged.**

- **The remainder of the Fernald property (zone 3) should be made available for the uses most beneficial to surrounding communities, recognizing that a mixed use strategy may be the most beneficial. While encouraging uses that provide economic and social benefit to surrounding communities, the Fernald Citizens Task Force strongly recommends the prohibition of any sort of agricultural or residential uses, or any uses involving the importing of hazardous, radioactive, mixed, or solid waste for any reason, or the generation of hazardous, radioactive, or mixed waste.**

- **DOE must refrain from making any commitments for potential future uses of property following remediation until community input has been registered.**

- **In planning for the future use of the Fernald property, sufficient space should be provided for the permanent relocation of any Native American burial sites exhumed in the vicinity of the Fernald property.**

- **All property containing the on-site disposal cell (zone 1) and surrounding green space (zone 2) must remain under federal government control and ownership in perpetuity.**

- **The remaining property at Fernald (zone 3) must remain under federal government control and ownership until remediation is complete. Any changes of**

ownership, leasing, or control of property must be conducted after determining the local communities' preferences for use and ownership, and with strict assurances that necessary monitoring of air, water, and soil will be conducted, maintenance of the disposal facility will take place, land use restrictions will be clearly enforced, and a program for prompt response to any future release of contamination is in place.

- **The use of any Fernald property other than for remediation purposes prior to the completion of remediation should be carefully screened to ensure that such use does not present any additional health or safety concerns and that remediation progress is not hampered in any way.**

- **All future uses of the Fernald property must protect and enhance existing natural resources, with particular emphasis on the Great Miami Aquifer, Paddys Run, and forested wetlands.**

Key Issues Evaluated

Discussion of future uses of the Fernald property was the foundation upon which all Task Force recommendations were built. The Task Force was most concerned with the ability of area residents to maintain their homes and livelihoods safely and continuously with the least amount of negative economic impact possible. Having some benefit from the property after remediation was a strong theme in all discussions.

The Task Force's mission was to outline the overall plan for bringing Fernald back to productive and safe uses, and to identify the general categories of uses that should not be allowed at the site after remediation. In evaluating future uses for the Fernald property, the Task Force did not intend to identify specific uses of the land in the sense of planning or zoning. The Task Force believes it is best that those decisions be made by the persons who would ordinarily make such decisions — people of surrounding townships, and local planning and zoning officials. In particular, residents adjacent to and immediately impacted by the future use of Fernald should be provided significant access to and participation in decisions regarding specific future use and ownership of the Fernald property. Moreover, the specific decisions will be better made closer to the time

when actual use is being contemplated, actual reuse of any Fernald property being at least a decade away.

The location of a disposal facility on-site was a major factor in future use recommendations. Though it was recognized that the disposal facility posed no immediate danger to human health through direct contact, it was felt that the perception of the disposal facility was strong enough to warrant strict isolation from any surrounding uses. Ohio solid waste landfill siting requirements were evaluated in determining an appropriate buffer space. Most Task Force members felt that the disposal facility should be as inconspicuous as possible, while still maintaining the desired isolation. In the final analysis, the consensus values developed early in the process provided the best overall understanding of the guiding issues which the Task Force believes should be followed in contemplating the future use of Fernald.

Impact Of Recommendations

While the Task Force has not yet received formal responses from DOE with regard to all of its recommendations, input from the Task Force has already resulted in dramatic changes to the decision-making process, as well as the decisions themselves. As a result of close coordination and ongoing sharing of ideas and information, the Task Force recommendations and the site's records of decision have been similar. Because the Task Force and the OU5 decision-making process occurred simultaneously, many of the Task Force's recommendations were incorporated into DOE's process. The remediation levels presented in the OU5 proposed plan are sufficiently similar to those recommended by the Task Force to provide for future uses of the Fernald property consistent with those envisioned by the Task Force.

Task Force recommendations have resulted in direct changes to the remedial approach at Fernald. For example, the Task Force members and the general public were able to reverse a proposed decision for in-place capping of OU2 materials. Moreover, the Task Force's recommendations to accelerate remediation helped to bring that alternative to DOE headquarters attention, and resulted in a significant increase to Fernald's budget to support this approach. These preliminary commitments are an important first step to achieving remediation within the schedule recommended by the Task Force.

VI. NEXT STEPS

Though the formal mission of the Fernald Citizens Task Force has been completed with the presentation of these recommendations, the members believe that the Task Force's usefulness has not ended. From its inception, the Fernald Citizens Task Force had a dual mission. Its charter identifies specific subjects for its consideration, and the Task Force followed those instructions closely, regularly avoiding opportunities to be sidetracked by other issues. However, the Task Force's charter provides for staggered terms and reappointment, as well as dissolution by action of the membership.

Dissolution of the Fernald Citizens Task Force at this time is a possibility for several reasons. Dissolution of the Task Force would be consistent with the task-oriented approach of the group: once the task is over, the group dissolves. Dissolution of the Task Force would also avoid institutionalization of the group. The Task Force was careful to conduct substantial community outreach to avoid the kind of isolation that typically occurs with a group that has formed internal cohesion, works closely with governmental agencies, and develops a greater degree of knowledge than the average observers of site-related activities. While the Task Force was largely successful in avoiding this isolation, the threat remains and is likely to increase over time. Member burn-out also must be considered. The time required of members cannot be overstated. The level of attendance at meetings was high, and can at least be partially attributed to the task orientation. A focused goal and process were essential to maintaining interest.

The above arguments notwithstanding, the Task Force has concluded that dissolution of the Fernald Citizens Task Force at this time would not serve the best interests of DOE or the community. DOE has a continuing need for organized, informed citizen

input. The total remediation process is a long-term enterprise, and it is certain that conditions will change as it proceeds. The Task Force's recommendations are not self-executing, so a continuing presence for monitoring, clarifying, and (if necessary) revisiting recommendations will be useful.

Important, far-reaching decisions in the CERCLA remediation process do not end with records of decision. Detailed design plans must still be developed, and they involve many potentially controversial choices. For example, a major local concern about the disposal facility recommended by the Task Force is the associated stigma on local property values. A well-crafted design that takes such concerns into account can alleviate much of that effect by making the disposal facility as unobtrusive and aesthetically pleasing as possible.

Difficult choices are often faced during remediation as unexpected field conditions can result in the need to change established designs. Furthermore, legal requirements have changed during the Task Force's own deliberations, and more changes can be expected. Finally, the vagaries of the budget process are likely to call for decisions on priorities throughout the remediation period. Where DOE and the regulators must exercise discretion, informed public input will continue to be helpful.

As focused as the Fernald Citizens Task Force was on specific issues, other issues were necessarily and wisely postponed. The best example is detailed land use planning and associated economic development. The future use exercise undertaken by the Task Force involved setting general boundaries on the potential future use of the site, rather than making specific land use recommendations. It was targeted primarily at present-day regulatory and technical choices and could only guess at long-term community development needs.

Detailed land use and economic development recommendations can only be made by those persons intimately concerned with local and regional economic development, land-use planning, and zoning. The Task Force could move into such a role, but not without some revision of its current membership, since it is not well-suited for this particular task.

The Task Force members, DOE, EPA, and OEPA find the arguments to maintain the Task Force persuasive. Ongoing Task Force activities are expected to include monitoring the implementation of

the Task Force's recommendations into the design and construction phases, evaluating closure, and perhaps long-term monitoring of the facility. The Task Force also hopes to have some role in economic development issues. The Task Force will reconvene in the fall of 1995 to evaluate these options.

Presently, the most sensible option is to maintain the Task Force in its present form, a small group representing a broad range of stakeholders, but meeting less frequently. This arrangement would take advantage of the administrative and information-gathering infrastructure that has already been established, as well as the high degree of recognition the Task Force has built within the community. Such an arrangement would also guard against the haphazard revisiting of the original recommendations by an entirely different group of citizens. Willingness to serve on intensive advisory boards such as the Task Force would be diminished if their conclusions were casually superseded by others.

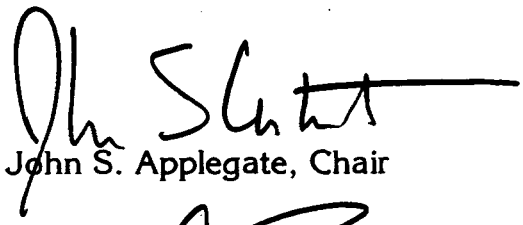
The primary challenge of continuing to maintain the Task Force would be creating and maintaining focus on a more diffuse set of issues than were faced under the initial charter. Without focus and intensive development of specific issues, the group's recommendations will not have the weight of the original recommendations. There would also be potential for the Task Force to micromanage random issues, which would detract from the group's authority.

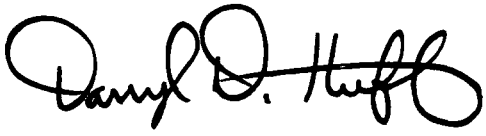
Focus can best be created by organizing around a series of short-term, intensive evaluations over the long-term remediation operations. Timing of activities will have to be coordinated carefully with significant anticipated decisions. In addition, ways must be found to keep the Task Force apprised of current and developing issues at the site. A system of regular communication with DOE and continuity of Task Force staff will be critical to success.

The difficulties of maintaining an effective Task Force over the long term are significant, but, sustaining this continuity is essential. It is important to build on the success and credibility of the original Task Force by ensuring effective implementation of the concepts and spirit embodied by the Task Force's recommendations. Focus, teamwork, knowledge, and self-discipline all of which are important ingredients of the Fernald Citizens Task Force's success – are difficult to replicate. Continuation of the Task Force is the most effective approach to ensuring balanced representation of local citizenry in decisions that will affect lives of residents near Fernald for many generations.

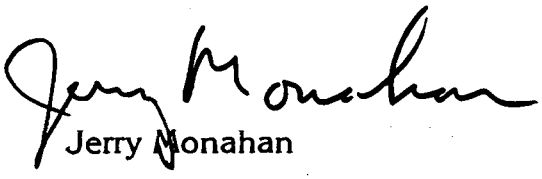
Respectfully Submitted, July, 1995

FERNALD CITIZENS TASK FORCE


John S. Applegate, Chair


Darryl D. Huff


James C. Bierer


Jerry Monahan


Marvin W. Clawson


Thomas B. Rentschler

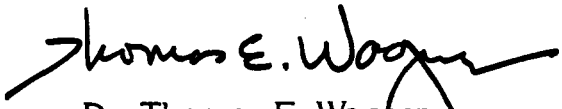

Lisa Crawford


Robert G. Tabor

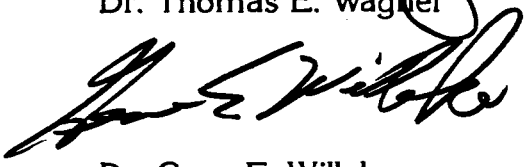

Pamela Dunn


Warren E. Strunk


Constance Fox, M.D.


Dr. Thomas E. Wagner


Guy C. Guckenberger


Dr. Gene E. Willeke

EX OFFICIO MEMBERS

Jack Craig
J. Phillip Hamric
Gene Jablonowski
Graham Mitchell
Jim Saric

GLOSSARY

aquifer - a natural underground supply of water, capable of providing significant quantities of groundwater to wells and springs. (see also groundwater, perched aquifer, and sole-source auifer)

asbestos - a strong and incombustible fiber widely used in the past for fireproofing and insulation. The small, buoyant fibers are easily inhaled or swallowed, causing a number of serious diseases including: asbestosis, a chronic disease of the lungs that makes breathing more and more difficult; and cancer.

background levels - concentrations of substances equivalent to that found naturally in the environment. May include amounts from man-made sources, but not from the specific source under investigation. Background levels will vary according to geographic locations. Background levels for uranium surrounding the Fernald site are 3.7 ppm in soils and 1.2 ppb in groundwater.

CERCLA - the Comprehensive Environmental Response, Compensation, and Liability Act (also known as Superfund), the federal law that guides remediation of hazardous waste sites.

CERCLA process - a process of site investigation and remediation as outlined in CERCLA regulations and guidance which include a remedial investigation, feasibility study, proposed plan, and record of decision, followed by remedy design and construction. (see also remedial investigation, feasibility study, proposed plan, and record of decision)

contaminants of concern - those compounds believed to be present at a hazardous waste site at concentrations exceeding safe health levels.

consent agreement - an agreement, entered into voluntarily between two or more parties, which is legally binding on the parties.

escalated cost - represents the actual dollars that will have to be appropriated over the life of the project. Often, total project costs are given in present worth format, which uses a discount factor to account for inflation and bring out-year costs to present year values. As a result, present worth shows a lower total cost number than total escalated cost.

exposure scenarios - the set of assumptions regarding human use of land and natural resources which identifies the amount of exposure to contamination that individuals can expect to incur.

exposure pathways - the routes by which humans can be exposed to contamination. For example, groundwater exposure pathways to humans include drinking water from wells, direct contact with skin, and inhalation of vapors during showers.

Federal Facilities Restoration Dialogue Committee (FFERDC) - a national group consisting of representatives of several federal agencies, state agencies, state governmental associations, Native American groups, national environmental groups, labor organizations, and other stakeholders convened to conduct a national policy dialogue on federal facility environmental priority-setting. Also sometimes referred to as the Keystone group.

federal facility compliance agreement - a formal legal agreement between a federal agency owning or operating contaminated property and the U.S. Environmental Protection Agency to conduct remediation efforts. The relevant state regulatory agency is also sometimes included in the agreement.

feasibility study (FS) - the CERCLA-mandated study following a remedial investigation (RI) which identifies, develops, and evaluates remedial action alternatives.

Fernald Dosimetry Reconstruction Project - a study conducted by the U.S. Centers for Disease Control to estimate doses to the public who lived near the Fernald site from radionuclides released to the environment during operation of the facility.

glacial overburden - a general term used to collectively refer to different types of shallow soils originally deposited by glacial activity.

groundwater - water beneath the earth's surface that fills pores between materials such as sand, soil, or gravel. Groundwater is a major source of water for agricultural and industrial purposes and is an important source of drinking water for about half of all Americans.

half-life - the time required for a radioactive substance to lose 50 percent of its activity by radioactive decay, gradually becoming a more stable substance. The half-life of the uranium-238, for example, is about 4.5 billion years.

hazard index - a measure of noncarcinogenic risks to human health posed by multiple contaminant exposures within a single medium or across media. A hazard index equal to or less than one indicates that adverse noncarcinogenic effects are not anticipated.

hazardous waste - waste material that is considered by federal law to be particularly dangerous due to its ignitability, corrosivity, reactivitiy, or toxicity.

heavy metals - metals whose densities are at least five times greater than water, such as cadmium, lead, and mercury. High concentrations of heavy metals are toxic to humans. A number of heavy metals are found at Fernald, including uranium.

legacy wastes - waste from production operations at Fernald that was left over when production was halted. Primarily located in the former production area, most of these materials are drummed and awaiting shipment for off-site disposal.

levels of acceptable risk - pertains to the excess lifetime risk of contracting cancer that is considered allowable following remediation. Risk following remediation is also called residual risk. EPA considers excess risks in the range of 1 in 10,000 (1x10-4) to 1 in 1,000,000 (1x10-6) to be acceptable. A specific risk level must be selected before remediation levels can be established for contaminants. (see also 1x10-4)

Maximum Contaminant Level (MCL) - the regulatory limits established under the Safe Drinking Water Act for various chemicals in drinking water.

mixed waste - contaminated materials containing both hazardous and radioactive compounds.

National Priorities List - those hazardous waste sites that have been identified under the Superfund program as the nation's most dangerous.

Nuclear Weapons Complex - the collection of federal facilities, largely owned and operated by DOE, used in the development, manufacturing, assembling, and testing of nuclear weapons.

operable unit (OU) - a component of overall site remediation that is approached as a discrete problem. Usually comprised of specific geographical locations or similar contamination. The Fernald site is divided into 5 operable units.

parts per billion (ppb) - a means of expressing the concentration of a compound relative to the media in which it is present. Parts per billion is often associated with contamination present in water and refers to very small quantities of material. If parts were expressed in gallons, then one part per billion of a compound in water would mean that one gallon of that compound would be present in every one billion gallons of water.

parts per million (ppm) - a means of expressing the concentration of a compound relative to the media in which it is present. Parts per million is often associated with contamination present in soil and refers to very small quantities of material. If parts were expressed in pounds, then one part per million of a compound in soil would mean that one pound of that compound would be present in every one million pounds of soil.

perched aquifer - a body of groundwater restricted to vertical flow. The perched aquifer beneath Fernald has limited yield and is not a drinking water source.

polychlorinated biphenyl (PCB) - a group of synthetic, organic chemicals once widely used in electrical equipment, specialized hydraulic systems, heat transfer systems, and other industrial products. They are highly toxic and potent carcinogens. Any hazardous wastes that contain more than 50 parts per million of PCBs are subject to regulation under the Toxic Substances Control Act.

proposed plan - a CERCLA required document which outlines the alternatives being considered for remediation of a site and identifies the preferred option of the agency conducting remediation.

radium - a naturally occurring radioactive metal generally found in uranium ore. A natural decay product of uranium-238.

record of decision (ROD) - the formal document which states the remediation option finally chosen at a Superfund site.

remedial investigation (RI) - a CERCLA required process in which physical and chemical analyses are conducted to characterize the nature and extent of contamination at a site. A remedial investigation report is produced to describe these findings.

remediation levels - the concentrations of contaminants that are the target for remediation efforts.

removal - a CERCLA term for remediation actions taken to provide quick response to a hazardous situation. Removal actions generally take less than 12 months to complete and cost less than $1 million.

residual risk - the level of risk from contaminants that remain following remediation of the site. (see also levels of acceptable risk)

radon - a radioactive gas produced by the decay of radium. EPA considers radon to be hazardous in unventilated areas, because it can build up to high concentrations and, if inhaled for long periods of time, may cause lung cancer.

sole source aquifer - a designation given by the USEPA to aquifers which, if contaminated, would pose a significant risk to human health.

solvents - a group consisting of hundreds of chemical compounds that dissolve other substances.

stakeholder - any individual or group who has a defined interest in the decision-making or the outcome of a remediation project. These interests may include, but are not limited to impacts on health, safety, and property.

Superfund - see CERCLA.

thorium - a naturally occurring radioactive metal. Fernald was a national repository for thorium during its operation. This material is currently being shipped off-site.

uranium - the heaviest element found in nature. It is radioactive and a heavy metal.

waste acceptance criteria - the contaminant concentrations calculated specifically for the Fernald site as a standard for those materials that can remain in the on-site disposal facility. The waste acceptance criteria were calculated to protect the aquifer from levels of contamination exceeding drinking water standards for at least 1,000 years.

1×10^{-4} - a scientific notation used to represent the excess statistical chance of contracting cancer over the course of a lifetime due to a specific exposure to a particular chemical at a particular concentration. Excess risk of contracting cancer is the amount from a specific source that is in addition to cancer risks posed by everyday activities. Current total risk of contracting cancer in the United States is as high as 1 in 3. A risk of 1 x 10-4 is equivalent to a chance of one in 10,000. This means that one person in 10,000 would be expected to contract cancer as a direct result of the specific exposure being investigated.

1 x 10-^{5} - equivalent to a chance of one in 100,000. This means that one person in 100,000 would be expected to contract cancer as a direct result of the specific exposure being investigated.

1 x 10-^{6} - equivalent to a chance of one in 1,000,000. This means that one person in 1,000,000 would be expected to contract cancer as a direct result of the specific exposure being investigated.

APPENDIX A

Timeline of Key Activities
and
Summary of Meetings

TIMELINE OF KEY TASK FORCE ACTIVITIES

January 1993 - February 1993:	DOE and its contractor begin organizing ideas for establishing a citizens advisory board at Fernald.
March 1993:	DOE, USEPA, and OEPA decide to use an independent convener to establish the advisory board, and identify criteria for convener.
April 1993:	DOE searches for a convener.
May 1993:	Dr. Eula Bingham from the University of Cincinnati is hired as convener and begins work on charter and identification of potential stakeholders.
June 1993:	Bingham works within Ross, Crosby, and Morgan townships to talk with stakeholders, and receives recommendations from local trustees.
July 1993:	Bingham sends a letter to local residents announcing a public meeting to discuss the citizens advisory board. The meeting is held, and trustees from all local townships attend.
August 1993:	Bingham delivers the membership slate to DOE; the entire slate is accepted. Bingham recommends John Applegate, a law professor at the University of Cincinnati, as the Task Force chair.
September 1993 - November 1993:	First meetings of the Task Force are held. The Task Force tours the site, is provided background information, and works to approve charter and develop ground rules.
December 1993:	Douglas Sarno, Phoenix Environmental, is hired as the Task Force technical consultant.
January 1994:	The Task Force approves its 18-month work plan.
February 1994 - August 1994:	The Task Force focuses on technical site information and evaluation of alternative future uses and cleanup levels. The "FutureSite" exercise is developed to evaluate alternative future uses for the Fernald Site.

September 1994: The Task Force finalizes and approves consensus values.

November 1994: The Task Force releases its interim report identifying recommendations for cleanup levels and future use.

December 1994: The Task Force approves its revised work plan for 1995 activities.

January 1995: The Task Force holds a public workshop to discuss waste disposition issues.

February 1995: The Task Force releases its waste disposition recommendations.

April 1995: The Task Force releases its recommendations on site priorities.

May 1995: The Task Force releases its final future use recommendations.

July 1995: The Task Force releases its completed recommendations report.

SUMMARY OF TASK FORCE MEETINGS

Note: Key Task Force decisions are indicated with a ★.

September 9 and 18, 1993 Meetings

The Task Force conducted site orientation and tour.

October 14, 1993 Meeting

★ The Task Force charter was approved.

★ The Task Force ground rules were approved.

★ Task Force members determined that outside staff support was needed; a subcommittee was created to develop a scope of work for outside staff.

★ The Task Force recommended to DOE that Darryl Huff, a Morgan Township resident, be added to the Task Force.

December 9, 1993 Meeting

★ The Task Force decided to address future use as its first priority because members believe a recommendation on future use is the foundation for decisions on other strategic issues.

January 15, 1994 Meeting

★ The Task Force asked DOE to develop a plan to notify the public about waste shipments to and from Fernald.

January 15, 1994 Meeting (continued)

The Task Force discussed future land use options and criteria for the Fernald site in a brainstorming session. The options and criteria offered by members included:

Industrial Park
Residential
Site will be split
North/South - Storage
Recreational
Museum of Nuclear Power Energy
Education, History
Wildflowers, scenic preserve
Extended Employment - Atomic "Deprocessor"
Natural Ecosystem Preserve
Research facility
Agriculture, grazing
Memorial park/cemetery
Storage facility for wastes
Industrial - Use of existing infrastructure
Disposal facility
Technology and development - research facility
Memorial to site activities
DOE control forever
Police/fire/CPR training facility
Waste cells in northern part of site, away from groundwater
Trees/sanctuary
Hospital - national focus
Reading room/accessible historical
Wetlands/Preserve/Research
Limited access/DOE control
Focus on not repeating mistakes
Tax base protected under any ownership
Park
Multiple uses
Reduce physical barriers
Government offices
Restricted from materials brought in from off site
Paddy's Run undisturbed
Wetlands/Natural Areas Preserved
Existing infrastructure contaminated
Power Plant (gas, nuclear)
Creation of trust for control
Yard waste/composting
Connection to Great Miami River

January 15, 1994 Meeting (continued)

Increase public access/green space
Centralized training/education center
Centered on nuclear/environmental education
Both government and private
Pristine cleanup
Ecology center
Get to the point of no negative impacts
Let nature take over/green space
Gives back to community
Rail system on direction
Low level rad disposal
Self supporting/non DOE facility
Do not preclude better cleanup in the future
Federal government (not necessarily DOE) control/responsibility, regardless of owner
Oversight and responsibility
All uses should have acceptable risk
Federal penitentiary
Waste Water Treatment facility
Build on existing technology and infrastructure
Federal Facility Compliance Act Treatment Center
Public school
Water processing/water sales
Preserve site history - research
Educational tools created
Archives, DOE records
Warehouses
Uses over time may change
Recycling center
Any process should be non-hazardous
Laboratory
Full health care retirement village
Creation of environmental monitoring zone/research
Vocational training, community college
Identify significant natural areas
Expand and connect with existing off-site uses
No increase in risk
No further defacement of environment
Must be reconciled with local zoning/planning
Must include input from public at large
Beyond five-mile radius

January 15, 1994 Meeting (continued)

Upon request of the chair, members of the audience volunteered additional options during the Task Force's discussion of future land use at Fernald. Those ideas included:

- Transportation hub
- Sports complex - community or professional
- Regional Airport

February 12, 1994 Meeting

★ The Task Force approved its work plan, which outlined the issues it planned to address, the work product to be developed, and the schedule of those activities.

★ The Task Force approved DOE's hazardous materials and waste shipments notification plan. The Task Force asked that DOE provide the information to local governments and emergency management officials, as well as any individual or group that requests it, and notify the parties of incoming hazardous materials.

The Task Force identified future use criteria for consideration. The criteria included:

Environmental Criteria

- identify/preserve significant natural ecosystems, including:
  - wetlands
  - Paddys Run
  - threatened/endangered species
- no future defacement of environment
- on-site storage must be protective of groundwater
- protect the great miami aquifer, protect air and soils, future protection
- no net increase in risk

Social and Human Criteria

- gives back to community
  - beneficial to the community
  - offers benefits to the community
- do not repeat past mistakes
- all uses must have acceptable risks
- existing and future people (children)
- safety be kept in mind
- must include ideas from the public at large (greater 5 miles)
- be conducive with off-site uses,compatible with surroundings
- promotes history/research/education (site, nuclear energy)
- turning around what was a negative into a positive

Economic Criteria

- provides some type of employment
  acknowledge the work force may go away after cleanup
- protects tax base
- build on existing infrastructure, if possible (cushioning the impact of a loss of employment at the site)

Long Term Management Criteria

- create trust and funding mechanism for control
- long-term entity to control property, responsibility in perpetuity
- reconcile w/local zoning and planning
- flexibility to provide for future changes in use/better cleanup (tradeoffs)
- federal government must retain responsibility/ownership regardless of ownership (discussion of ownership came up in terms of taxes for local communities)
- assurance citizens will be involved in decision process about the site
- monitor and be accountable for any contamination and waste left on site

General Use Criteria

- recognize mixed uses may exist
- reduce physical barriers
- be a better neighbor to surrounding community
- no waste import
- recognize impacts of off-site waste shipment
- consider all political, safety and health impacts
- only non-hazardous uses
- no net increase in risk
- want a decrease of risk

★ The Task Force identified the following information needs:

- history and strategy for managing uranium discharges
- vocabulary and concepts land use planning
- levels of contamination
- formats similar to the draft Site Development Plan
- consistency of data in tables
- how and to what extent the aquifer is being affected
- terminology be defined, chemicals, metals, emergent wetlands
- disposal storage, tradeoffs discussion
- information about the quality of natural resources and infrastructure
- methods of removing wastes, technologies
- resources available from DOE and FERMCO
- current site activities

February 12, 1994 Meeting (continued)

★ The Task Force decided to use in its discussions the classes of land use that have been identified by DOE:
- industrial/commercial
- residential
- agricultural
- recreational
- Native American/cultural

March 12, 1994 Meeting

The Task Force and members of the public in attendance identified the following threats from Fernald which have relevance on future use considerations:

Drinking water wells and contaminated water off site
Air quality during remediation
Risks of transportation
Lack of funds
Loading the aquifer with contamination
Combined risks of multiple contamination
Long-term impacts of not having information (secrecy)
Impact of Paddy's Run Road Site
Time management
Complex-wide decision impacts
Not having off-site disposal options
Lawsuits from mismanagement
Vulnerable populations
Shipments from off-site
Changes in laws and regulations
Natural disasters
Worker and resident health and safety
Non-uranium contaminants
Environmental risks from remediation to wildlife
Stress/psychological risk from process and unknowns
Agricultural products
Exposure to any radioactivity
Exposure to any toxics
Property values
Any residual contamination
Radon
Natural Resources including groundwater, wildlife, land, and air
Loss of jobs/impact on local economy
Perception of mismanagement
Unachievable goals

April 9, 1994 Meeting

The Task Force discussed potential remediation technologies, including:

- vitrification (turning contaminated materials into glass)
- soil washing (using a solvent to remove contamination)
- cementation (immobilizing constituents in waste with cement)
- thermal drying (removing water and other liquids with heat)

May 14, 1994 Meeting

The Task Force and members of the public ran the *FutureSite* exercise using a $1x10^{-5}$ remediation scenario.

June 11, 1994 Meeting

The Task Force and members of the public ran the *FutureSite* exercise at the more conservative 10^{-6} risk level. Other changes made to the exercise included:

- New volumes that incorporated materials from OUs 2 and 3.
- Elimination of the treatment option because under current the regulations, the "clean" fraction of soil would still have to be handled as waste.

DOE officials, contractor managers, and members of the public also played *FutureSite*. The Task Force discussed the preliminary findings playing the game. Two basic variables were analyzed:

1. Use of Property:
   Restricted
   Undeveloped Park/Greenspace
   Developed Park
   Commercial/Industrial
   Residential/Agricultural

2. Disposition of Waste:
   On-Site
   Off-Site (limited to one million cubic yards)

These strategies emerged from playing *FutureSite*:

1. The Buffer Strategy

Many groups were concerned most with cleaning up the edges of the property as much as possible and leaving the more contaminated materials in the center of the site at the location of the former processing facility.

2. The Incremental Land Use Volume Strategy

Some groups approached the problem from an incremental cost-benefit approach by removing successively less contaminated material to achieve a higher level of allowed use and stopping after each iteration to calculate total cost.

Regardless of the strategy employed, the result for almost all groups was to clean up to allow for two uses: less restrictive on the borders and more restrictive in the center. In each case, the location of the disposal facility coincided with the more contaminated center.

Three preliminary scenarios resulted from the initial rounds of the exercise:

1. Residential Border, Commercial Center
   100 percent on-site disposal: $662 million (127 acres)
   With 1 million cubic yards off-site: $1.262 billion (50 acres)

2. Residential Border, Park Center
   100 percent on-site disposal: $661 million (127 acres)
   With 1 million cubic yards off-site: $12.61 billion (50 acres)

3. Commercial Border, Park Center
   100 percent on-site disposal: $459 million (88 acres)
   With 1 million cubic yards off-site: $1.006 billion (11 acres)

Approaches used by players included:

A. Clean To, But Do Not Allow
   Several groups sought residential cleanup levels, but did not wish to see the property to be used for anything other than green space.

B. Prevent Ecological Destruction
   Some groups were concerned with the ecological damage that would coincide with large-scale removal of soil and vegetation.

C. Limit Off-Site Transportation
   Some groups were highly concerned with the number of trucks or trains that would be required for large volumes of off-site waste disposal.

D. No Physical Sign of Contamination
   One group raised concern about uses that would result in physical access restrictions to property.

June 11, 1994 Meeting (continued)

E. Adjacent Property at Same Use
Several groups were concerned that the property immediately at the border of the site was cleaned to the same use as that off-site.

The Task Force cancelled its July and August meetings in order to evaluate the future use scenarios developed using FutureSite and to develop detailed information for decision making.

September 10, 1994 Meeting

★ The Task Force reached agreement on its consensus values, which were developed from the future use criteria.

Future use scenarios were evaluated by the Task Force as follows:

Scenario 1	Resident Border/Industrial Center at 10-5
Scenario 1a	Resident Border/Industrial Center at 10-6
Scenario 2	Resident Border/Park Center at 10-5
Scenario 2a	Resident Border/Park Center at 10-6
Scenario 3	Resident Border/Green Space Center at 10-5
Scenario 3a	Resident Border/Green Space Center at 10-6
Scenario 4	Industrial Border/Park Center at 10-5
Scenario 4a	Industrial Border/Park Center at 10-6
Scenario 5	Industrial Border/Green Space Center at 10-5
Scenario 5a	Industrial Border/Green Space Center at 10-6
Scenario 6	Park Border/Green Space Center at 10-5
Scenario 6a	Park Border/Green Space Center at 10-6
Scenario 7	Total Green Space at 10-5
Scenario 7a	Total Green Space at 10-6
Scenario 8	North Green Space/South Industrial at 10-5
Scenario 8a	North Green Space/South Industrial at 10-6
Scenario 9	Total Residential at 10-5
Scenario 9a	Total Residential at 10-6
Scenario 10	Protection of Aquifer at 10-5
Scenario 10a	Protection of Aquifer and perched groundwater at 10-6
Scenario 10b	Protection of Aquifer at 10-6

The impact of soil uranium contamination on the concentrations of uranium in groundwater are critical to groundwater protection, the Task Force determined. If the goal is to protect the aquifer, then most land use options can be eliminated because the concentrations of uranium in the soil would not be low enough.

September 10, 1994 Meeting (continued)

If the groundwater is to be protected, only 4 of the 21 scenarios are viable:

- Total Residential at 10-5
- Resident Border/Industrial Center at 10-5
- Total Industrial at 10-5
- Total Residential at 10-6

October 8, 1994 Meeting

★ The Task Force endorsed a 10-5 risk level for groundwater and protect to MCLs.

★ The Task Force eliminated the 10-6 risk level from further consideration for soil.

★ The Task Force adopted a maximum risk level of 1 x 10-4 for land uses only.

★ The Task Force eliminated from further consideration all new residential and agricultural uses of DOE's Fernald Environmental Management Project property.

November 12, 1994 Meeting

★ The Task Force decided that the best use of DOE's Fernald property would not include agricultural or residential uses.

★ The Task Force decided to recommend 50 ppm for off-property soil contaminated by uranium to achieve the Hazard Index of 1 for cleanup levels.

December 8, 1994 Meeting

★ The Task Force approved the draft work plan outlining activities for 1995.

January 14, 1995 Meeting

★ The Task Force approved a motion on disposal and storage of non-Fernald wastes. The motion reads: "The Fernald Citizens Task Force strongly opposes the use of the Fernald site for the permanent disposal or long-term storage of any waste materials originating from other locations."

February 18, 1995 Meeting

★ A motion was presented to draft a formal resolution favoring an on-site disposal cell that would accept waste only from Fernald and within acceptable levels.

★ An amendment to the motion was presented and was added to identify the key considerations that went into making this recommendation,which included:

Provides the most immediate way to protect the aquifer,
Least total transport risk;
Cost considerations/availability of funds;
Risk to other communities;
Risk to environment;
Availability of disposal area elsewhere;
Risk to remedial workers and public;
Political realities;
Off-site waste;
Low levels of waste going in;
Definition of waste acceptance criteria;
Aesthetics, technology, and design;
Availability of monitoring;
Long-term ownership (Department of Energy);
Retrievability/new technology;
Risk at cell failure.

March 11, 1995

★ The Task Force took much of the meeting time rewording the considerations and conditions of the formal "Recommendation For An On-Site Disposal Facility At Fernald".

March 28, 1995

This special meeting was scheduled to complete the site priorities discussion from the March 11, 1995, meeting. The Task Force created a list of criteria for the priorities recommendation raised questions regarding needed funding and staffing levels under an accelerated approach. It was determined that Fernald should take advantage of the fact that it is different from other DOE sites and the opportunity exists to have a complete remediation in a reasonable amount of time.

March 28, 1995 (continued)

★ It was suggested that the priorities recommendation cover the following issues:

- Special Nuclear Materials
- Safe Shutdown
- Legacy Waste
- Simplify overlapping regulations
- Staffing levels

★ The Task Force asked the chair and the consultant to create a draft recommendation to establish site priorities and accelerate remediation at Fernald for the April 8, 1995, meeting.

April 8, 1995 Meeting

★ After some discussion and rewording of the draft recommendation developed by the chair and consultant, the Task Force voted unanimously to approve the recommendations for site priorities.

The Task Force asked the chair and the consultant to create a draft recommendation regarding the future use of the Fernald property for the May 6, 1995, meeting.

May 6, 1995

★ After some discussion and rewording of the draft recommendation developed by the chair and consultant, the Task Force approved the final "Recommendations Regarding Future Use Of Fernald Property".

June 10, 1995

The Task Force reviewed and amended the first draft of the recommendation report as prepared by the chair and the consultant.

July 8, 1995

The Task Force reviewed, made changes, and approved the final draft of the recommendation report.

APPENDIX B

Member Profiles

MEMBER PROFILES

John S. Applegate: Chair of the Fernald Citizens Task Force, he is an environmental law professor at the University of Cincinnati College of Law. His academic areas of specialty include risk issues and public participation. He received his undergraduate degree from Haverford College in Pennsylvania and his JD from Harvard University. Prior to entering academia. Mr. Applegate worked as an attorney in Washington, D.C.

James Bierer: A 7th grade science teacher in the Ross Local School District, which is located near the Fernald site. He is also involved in DOE's Community Leaders Network and has helped develop education outreach programs for Fernald.

Marvin Clawson: A long-time area resident whose family owns property near the Fernald site. He is a retired farmer and toolmaker.

Lisa Crawford: President of the citizens group, Fernald Residents for Environmental Safety and Health (FRESH) and a long-time activist. She is employed as the volunteer coordinator for a state hospital, the Lewis (Pauline Warfield) Center.

Pamela Dunn: Is employed as an auditor with the State of Ohio, and works primarily in the greater Cincinnati area. She also is the treasurer of Fernald Residents for Environmental Safety and Health (FRESH). She received her BBA from the University of Cincinnati.

Constance Fox, M.D.: A physician specializing in psychiatry in private practice in Cincinnati, she is a member of Physicians for Social Responsibility and of the Sierra Club.

Guy C. Guckenberger: Currently is the president of the Hamilton County Commission, the governing body for one of the two counties in which the Fernald site is located. In addition to his political activities, Mr. Guckenberger also is a practicing attorney.

J. Phillip Hamric: The head of DOE's Ohio Field Office in Miamisburg, Ohio, Hamric until June 15, 1994, he was previously the site manager at Fernald. He also has worked at DOE's Hanford and Idaho Labs facilities. He serves as an ex officio member of the Task Force.

Darryl D. Huff: An area businessman and lifetime resident, he also is the vice chairman of the Morgan Township Zoning Board. The Fernald site is located in three townships, of which Morgan is one. Huff also is chair of the Task Force's Waste Disposition Subcommittee, which is making a recommendation to the full Task Force on waste disposition and transportation issues.

Graham Mitchell: Chief of the Ohio Environmental Protection Agency's Office of Federal Facilities Oversight (OFFO). Mr. Mitchell has over ten years experience working on the Fernald site. He has a bachelors degree in zoology and a masters degree in environmental science, both from Miami University. He serves as an ex officio member of the Task Force.

Jerry Monahan: The executive secretary of the Greater Cincinnati Building and Construction Trades Council, which is one of the two primary union organizations representing wage workers at the Fernald site.

Thomas B. Rentschler: A retired businessman and banker, he is chair of the Miami Conservancy District, which is responsible for maintaining the integrity of the Great Miami River and associated habitats. Rentschler also was active in Ohio politics. He received an undergraduate degree in engineering from Haverford College.

Jim Saric: The Fernald site remedial project manager for the U.S. Environmental Protection Agency, Region 5. He has a BS and MS and also is an avid bass fisherman. He serves as an ex officio member of the Task Force.

Warren E. Strunk: An elected trustee in Crosby Township, one of the three townships in which the Fernald site is located. He is employed as a machine tool operator.

Robert G. Tabor: Director of Health and Safety for the Fernald Atomic Trades and Labor Council (FATLC), one of the primary union organizations representing wage workers at the Fernald site. He attended Purdue University and Cincinnati University. In 1992, he completed the DOE/Westinghouse School of Environmental Excellence. He also is employed as a millwright at the Fernald site.

Dr. Thomas E. Wagner: A professor of community planning at the University of Cincinnati. His areas of specialty include dispute resolution and sociology. He served as Vice President of Student Affairs and Services for the University of Cincinnati before returning to teaching full time in 1994. He has a doctorate in education.

Dr. Gene Willeke: A professor in the Institute of Environmental Sciences at Miami University, he received his doctorate from Stanford University and undergraduate degrees from Ohio Northern University.

APPENDIX C

Charter and Ground Rules

CHARTER

Citizens of Ohio have expressed an interest in providing a local viewpoint to guide the federal and state governments as critical decisions are made in the restoration and future uses of Fernald. The Department of Energy, U.S. Environmental Protection Agency, the Ohio Environmental Protection Agency are committed to the concept that a Citizens Advisory Task Force will serve the public interest and provide useful information and ideas. Because environmental restoration activities are at a pivotal juncture in the decision-making process, the Task Force's contributions are critical to the successful remediation of the Fernald site. There is a mutual understanding that stakeholders desire and deserve a role in the process that will influence their future for generations.

SCOPE

The focus of the Task Force is the future of the Fernald site. The Task Force will make recommendations regarding the potential uses of the Fernald site and the criteria for cleanup to ensure an environmental restoration that is appropriate for current and future generations. The Task Force recommendations will be made to the Assistant Secretary for Environmental Restoration and Waste Management (hereafter "Assistant Secretary"), the U.S. EPA Region 5 Administrator and the Director of Ohio EPA.

MEMBERSHIP

The Task Force is to be composed of no more than 15 Ohio residents, who are interested in the future of this site and who bring knowledge, views, technical expertise, and other skills to bear on a complicated technical and social problem: Fernald Cleanup. The members are appointed by the Assistant Secretary, with the concurrence of U.S. EPA Region 5 Administrator and the Director of Ohio EPA. Appointment of half of the original members of the Task Force shall be for 3-year terms and half for 2-year terms. Subsequent appointments will be for 2-year terms. No one is eligible for more than 2 terms. Two non-voting alternate members may be appointed and participate in the deliberations.

In the future, new members shall be appointed by the Assistant Secretary with the concurrence of U.S. EPA Region 5 Administrator and the Director of Ohio EPA, from a list of interested citizens that has been prepared by a subcommittee of the Task Force. Ex-officio members (non-voting) shall consist of one responsible person from each of the interested governmental agencies, U.S. DOE, U.S. EPA, and Ohio EPA. A quorum is 3/5ths of the voting members, and shall be required for decision-making.

RESPONSIBILITIES OF CHAIR

The Assistant Secretary with the concurrence of U.S. EPA Region 5 Administrator and the Director of Ohio EPA shall appoint one voting member of the Task Force to be its Chair. The Chair represents the Task Force in all official communications; presides at meetings; sets the times, places, and agenda for meeting; appoints committees; and retains consultants and is otherwise responsible for the administration of the Task Force.

TERMINATION OF TASK FORCE

The Task Force shall evaluate its work at 3 year intervals and decide whether to continue. The decision to discontinue must be agreed to by at least 2/3rds of the full voting membership of the Task Force.

FUNDING AND SUPPORT

The Assistant Secretary shall provide adequate funding for administrative support (including staff), travel and other expenses of the members, and technical assistance (including research, honorarium and travel of experts) that the Task Force deems is necessary.

WORK PRODUCT

The Task Force shall be guided by the deadlines under the Consent Agreement so that their advice is timely, and by the Interim Report of the Federal Facilities Environmental Restoration Dialogue Committee (February 1993). Recommendations from the Task Force to the agencies shall be in the form of written reports as deemed appropriate and shall respond to the following questions: 1) What should be the future use of the site? 2) Determinations of cleanup levels (How clean is clean?) 3) Where should radioactive and hazardous waste be disposed that is generated as a result of restoration activities? and 4) What should be the cleanup priorities?

Response to these questions depend on a set of conditions including but not limited to: 1) State of Ohio regulations and disposal criteria; 2) other state regulations regarding acceptance of waste; 3) available data on health effects and risks from the specific contaminants at the site; and 4) monies appropriated for cleanup. It is desirable that the Task Force set priorities for responding to questions and provide as much guidance as possible regarding their assessments.

DECISION MAKING

The Task Force shall work toward consensus reports regarding recommendations on various issues, however, on certain issues a minority report may be necessary. In these rare instances it is necessary to articulate in writing both the areas of agreement and disagreement and the reasons why there continues to be differences. Remedies recommended should be consistent with CERCLA.

AGENCY COLLABORATION

The agencies participating as ex-officio members of the Task Force shall assist the Task Force by providing technical expertise and assuring that all information necessary for Task Force deliberations is made available in a timely manner.

MEETINGS

The Task Force shall have regular public meetings in addition to working group meetings which will be announced in advance with an agenda. Such meetings shall be open to the public and opportunities for public comment shall be designated. The Task Force may vote to meet in executive session and formally vote during these sessions. Minutes of these meetings shall be available.

Adopted October 14, 1993

GROUND RULES

A. TASK FORCE OPERATIONS

The affairs of the Task Force will be conducted according to its Charter, the Interim Report of the Federal Facilities Environmental Restoration Dialogue Committee (February 1993), and these Ground Rules. In case of conflicts, the Charter is controlling.

B. MEMBERSHIP

1. ***Personal membership.*** While the membership of the Task Force is intended to represent a variety of stakeholders in the Fernald restoration, membership in the Task Force is personal and not representative. Members may not vote by proxy, and attendance and other requirements of membership cannot be satisfied by substitutes.

2. ***Attendance.*** Attendance at regular and special meetings is required of members of the Task Force. Except for emergencies or other compelling circumstances (as determined by the Chair), a member who misses either three consecutive meetings or five meetings over a twelve-month period shall be deemed to have resigned. Attendance ordinarily means the entire length of a meeting.

3. ***New members.*** The Task Force shall continuously attempt to identify stakeholders not represented on the Task Force. The Task Force shall recommend to U.S. DOE's Assistant Secretary of Environmental Restoration and Waste Management the appointment of new members or alternate members as necessary. The Chair of the Task Force may appoint a committee to find and interview candidates for membership.

4. ***Ex officio.*** In some cases, potentially responsible parties (PRPs) from the private sector that are directly involved in or affected by site cleanup activities could be added as ex-officio (non-voting) members at the discretion of the Task Force.

C. MEETINGS

1. ***Regular and special meetings.*** The Task Force intends to hold regular monthly meetings. The chair of the Task Force will schedule monthly meetings and may schedule additional special meetings with notice to all members.

2. ***Notice.*** Except in emergencies, the chair shall give notice of special meetings by mail or by telephone at least seven days in advance. Notice shall include the time, place, and subject of the meeting.

3. ***Agenda.*** An agenda for regular monthly meetings shall be provided to all members in advance of the meeting. The agenda shall include at least the time and place of the meeting, the topics to be covered, identification of relevant documents, and the times and places of non-Task Force meetings of importance.

4. ***Public participation.*** The public shall be informed of the time, place, and subject of all public meetings of the Task Force, and the public shall have an opportunity to participate in public meetings, in the manner deemed most appropriate by the chair or by the Task Force.

Adopted October 14, 1993

APPENDIX D

Summary of Public Comments

SUMMARY OF PUBLIC COMMENTS

COMMENTS RECEIVED AT TASK FORCE MEETINGS

October 14, 1993
A member of the audience asked if someone could explain why employees are not patronizing merchants as often as they had previously. Possible explanations included that the thirty minute employee lunch break was being enforced and that one of the access roads to the community had been closed because of the strike potential.

November 18, 1993
An unidentified member of the audience said that he was confused because he thought the Task Force was only deciding what to do with the site after cleanup. The response to his statement was that other issues are related to the question of what alternatives exist for the site after cleanup. Ken Moore, of the Hamilton County Regional Planning Commission introduced himself and offered his agency's services.

December 9, 1993
A member of the audience voiced the opinion that the Task Force would not be able to decide on future use until it had an idea of where the waste would be disposed.

January 15, 1994
Some members of the audience volunteered potential options during the discussion of future land use. Those ideas include:
1) Transportation Hub
2) Sports Complex - community or professional
3) Regional Airport

February 12, 1994
Members of the audience volunteered potential criteria during the Task Force's discussion of future use criteria at Fernald. Vicky Dastillung, Vice President of FRESH, suggested that the Task Force consider funding under long-term management. Another individual suggested looking at guidelines on long-term interim storage. Ken Moore, of the Hamilton County Planning Department, suggested adding public utilities as a potential use.

March 12, 1994
Public participation consisted of identifying potential risks associated with contamination at the site along with the major components of remediation. Doug Sarno, the Task Force consultant, explained that this information would form a basis for addressing the question of future use.

April 9, 1994
There were no public comments.

May 14, 1994
Public comments consisted of scenarios developed by members of the public while playing FutureSite at prior community meetings.

June 11, 1994
A member of the public asked how quickly contamination is migrating off site. John Applegate, Task Force chair, responded that migration has slowed virtually to a stop and under the South Plume Removal Action extraction wells are removing contaminated groundwater for treatment.

September 10, 1994
There was a great deal of discussion, in which the public participated, focused on whether future uses that do not protect the groundwater should be considered. There was additional public input during the review of future use alternatives.

October 8, 1994
Peggy Collins, co-president of the Hamilton-Fairfield chapter of the League of Women Voters, told the Task Force that she endorsed its recommendation regarding the aquifer.
Additional public input was received during discussions about protecting the groundwater and review of the future use alternatives.

November 12, 1994
Bill Knollman, of Knollman Dairy, responded to questions regarding the economic impacts of grazing, as it pertains to the Fernald property. He stated he leases the property for approximately ten dollars an acre. Knollman informed participants that he maintains the fences, except the perimeter fences which DOE maintains. He also said his family is going to discontinue the dairy operation in April and exclusively graze beef cattle. He added that dairy cows will not be pastured on the leased areas after Thanksgiving of this year. Knollman stated that his family plans to use the pasture for cattle grazing and expanding the grain operation. Knollman iterated that grazing is important to his operation and that he does not want to see grazing discontinued as a use of the Fernald property in the short-run because, economically, it would negatively impact his business. "I don't know of any group of cows that have been tested any more than ours have" he said, explaining that the cows are tested monthly by FERMCO, a federal group, and the State of Ohio.

November 12, 1994 (continued)
Chris Tickle with CLEAN, Inc., addressed the Task Force by making an analogy about perceived risk: "When a person invests money, that person has a sense of the risk. Everyone here has idea of what is acceptable risk after gauging the data. To me, that kind of explains why there is such a dialogue on the perception of risks on the site. It seems that you are going to have to find consensus

somewhere in between. The land is a resource and it's our land. I would prefer, if the data is there, to allow the land to be used, if it can be used. A person will have information on the deed, if the land is sold. We aren't responsible for educating everyone who walks by and we can't be responsible for everyone's uneducated level."

Edwa Yocum, local resident and FRESH member, also addressed the Task Force: "I'm sitting here and I'm getting rather mad because I am thinking we have lost all respect for ourselves. Connie Fox talked about the emotional and psychological effects of watching the cattle graze. We let the cows graze and we drink the milk and eat the meat and we are slowly poisoning ourselves. The government will outlaw second-hand smoke and cholesterol, but we will let ourselves be poisoned. Don't allow grazing. There is a question as to whether the government is really doing its job." Yocum said she didn't think money should be the cleanup driver and that safety is paramount. Later in the discussion, Yocum posed the question to a Task Force Member whether he would like to have his company next to a disposal cell.

Additional public conversation and input occurred during the discussion concerning grazing.

December 8, 1994
Dave Young, of Ross Township, said he was glad to see some open minds on the Task Force. He iterated that money should not be overly emphasized because neighbors did not ask for the site to be located there. He also said that he would be attending more upcoming meetings.

Larissa Gilham, Ohio Department of Health, said the Task Force also needs to be aware of the interest other sites have in protecting themselves from Fernald waste products.

Additional public public conversation and input occurred during the discussion surrounding the work plan.

January 14, 1995
Peggy Collins, Co-president of the Hamilton-Fairfield Chapter of the League of Women Voters, said that she agreed that it was of the utmost importance to protect the aquifer located beneath the Fernald site. She further stated that given the risks of off-site transport, keeping some radioactive waste on site was reasonable.

January 14, 1995 (continued)
Bob Copeland, a Morgan Township trustee, said he had submitted a written statement to Gary Stegner, DOE. He stated that Morgan Township could accept an on-site disposal cell if the surrounding conditions were satisfactory. He was personally concerned about off-site waste being brought to Fernald as a result of the Midwest Compact which is responsible for siting a low-level radioactive waste repository in the midwest region of the United States.

Additional public conversation and input occurred during the discussion concerning waste disposal issues.

February 18, 1995
Milton Whaley, a resident of Ross, Ohio asked Task Force members to vote for off-site shipment of radioactive materials.

David Young, Ross Township Trustee, also encouraged off-site disposal of radioactive materials and suggested that, if given thirty days, he could put together another meeting with Ross Township citizens in attendance.

Additional public conversation and input occurred regarding the disposal cell.

March 28, 1995
Richard Garrett, a Ross resident and FEMP employee, stated that cleanup could be achieved in five to eight years, but could not provide details. He suggested contacting local Congress people because the "window of opportunity" is open.

Additional public conversation and input occurred during the discussions about the waste disposal facility and the DOE budget presentation for the Fernald site.

April 8, 1995
Tom Szymoniak, a FERMCO consultant, shared information about the study he is conducting on the plants and grasses that grow in this area that could be planted on the disposal facility and grow compatibly with native vegetation.

Larissa Gilham, Ohio Department of Health, said that the State of Ohio legislature is currently considering a bill regarding low level waste disposal facilities in Ohio, which also addresses access controls and environmental monitoring zones.

May 6, 1995
Vicky Dastillung, a member of FRESH, asked about liability if someone developed health ailments after being within the 300 feet buffer zone. Doug Sarno explained that only low-level radioactive materials will be placed in the disposal cell which does not present a health hazard. Dastillung subsequently inquired whether the OU2 ROD included federal ownership as a requirement. Graham Mitchell suggested that the five year review period might be a good point for future use adjustments.

CALLS ON TASK FORCE TELEPHONE LINE

An unidentified man called over 50 times between the fall of 1994 and July 1995. He suggested that Fernald become a wildlife sanctuary, and that the CSX line be made a bike trail and connect it out at Oxford and then Houston Woods Park. He also directed a question to Guy Guckenberger as to whether he plans to retire out-of-state in a quiet area with less air pollution and read as a hobby about wildlife habitat and biodiversity after the sewer lines and housing development around Fernald is finished. He also asked Jerry Monahan if after they build their last house near Fernald, if they next plan to build a corporate park on the south side of Rumpke dump near Colerain Road.

An unidentified woman stated that Fernald should be saved as a future wildlife sanctuary or a forest nature preserve and the CSX right-a-way should be a future bike trail connected to Oxford and Houston Woods and the Miami Whitewater Forest.

The President of IGAU called in December of 1994 and said he is going to speak to DOE and other groups because he wants to know why the FCTF thinks it is such "an elite group" that it leaves out

important stakeholders from belonging to the Fernald Citizens Task Force. He is making a recommendation to DOE that all support funds be cut from the FCTF.

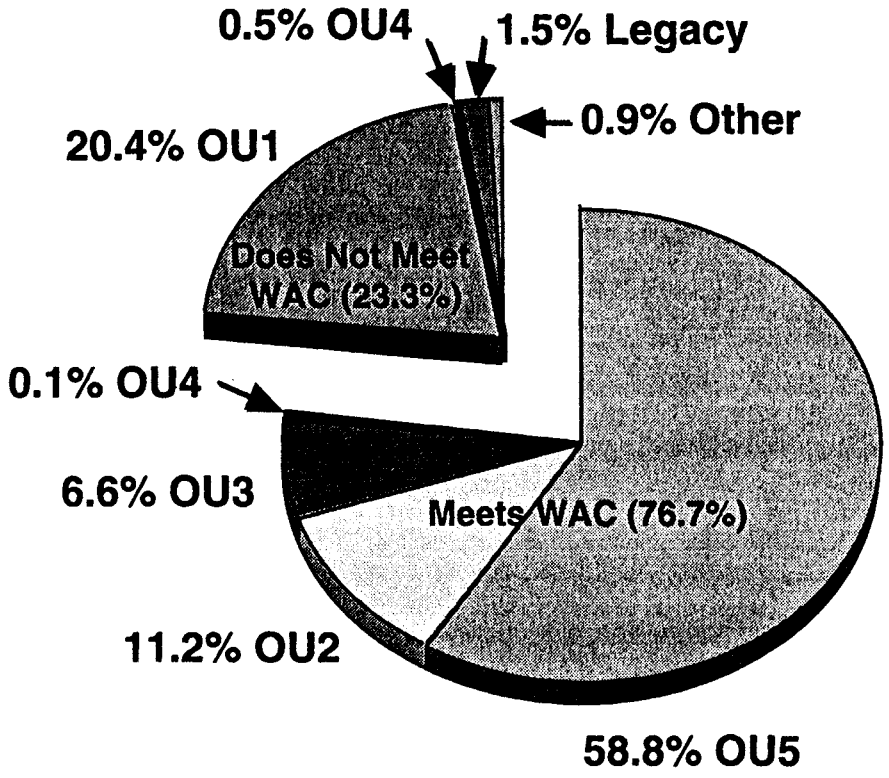
In March of 1995 a woman expressed dissatisfaction with the Task Force decision to allow some of the radioactive waste to stay on site. She feared that keeping radioactive waste on site will result in receiving waste from other areas, and Fernald does not have the facilities. She said that she lives 15 miles away and would like the waste moved to Nevada or Utah (to "get rid of it while we can").

May 1995, an individual called to be taken off the Task Force mailing list and suggested a 1-800 number for people who want to be taken off the mailing list to help save paper.

APPENDIX E

Key Elements of The Task Force Toolbox

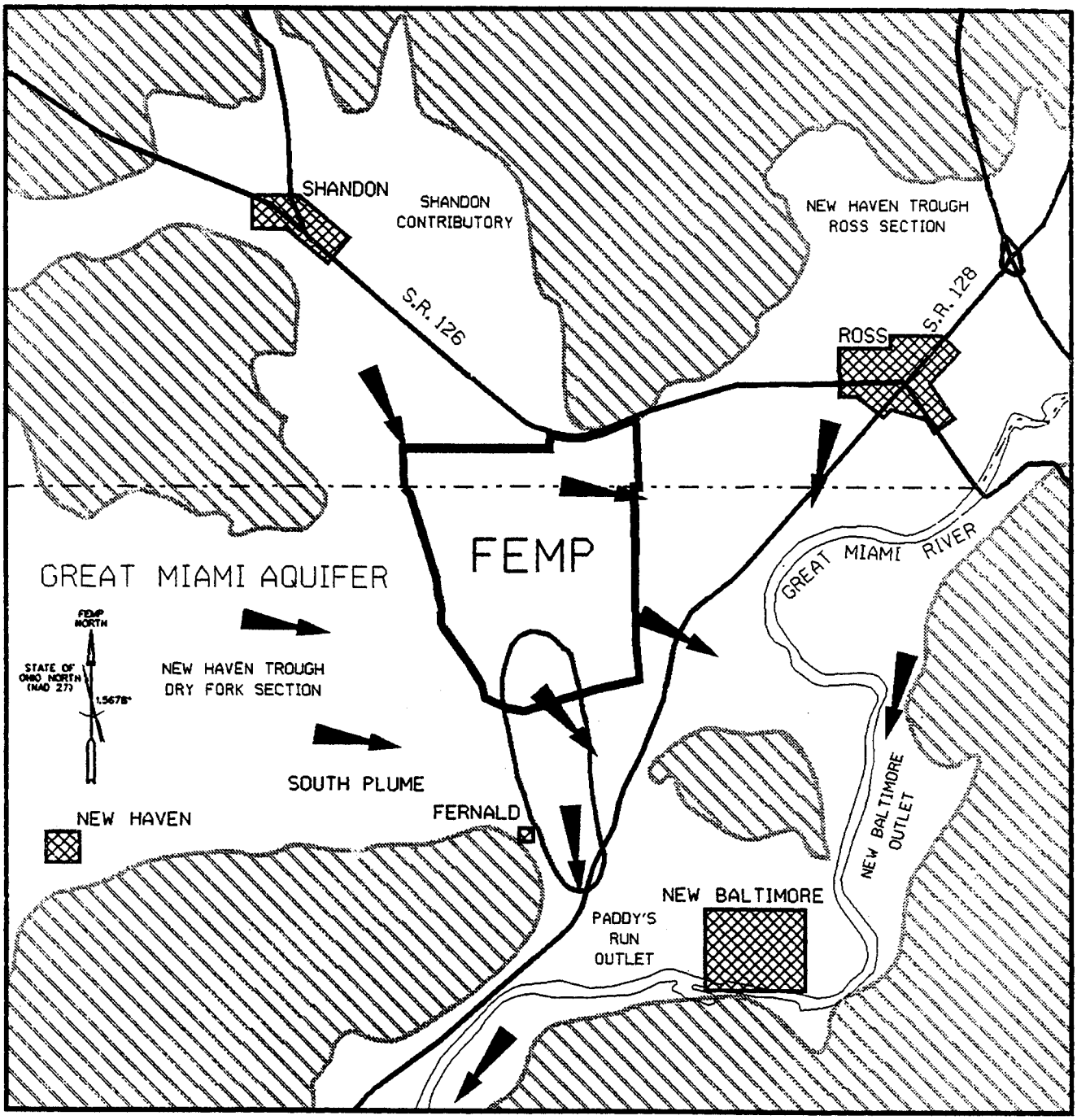
POTENTIAL DISPOSITION OF FEMP WASTE CONSIDERING WASTE ACCEPTANCE CRITERIA (WAC)



Waste Source

- OU5
- OU4
- OU2
- Legacy
- OU3
- Other
- OU1

	Total Volume	Volume Meeting WAC
OU1	628200	0
OU2	348600	345000
OU3	201600	201600
OU4	17000	3000
OU5	1835000	1810000
Legacy	46760	0



LEGEND:

- GENERALIZED GROUNDWATER FLOW DIRECTION.
- BEDROCK OUTSIDE GREAT MIAMI AQUIFER
- POPULATED AREAS

NOTES:

* DIRECTION OF GROUNDWATER FLOW BASED ON APRIL 1986 WATER LEVEL CONTOURS AND GROUNDWATER MODELING OUTPUT (3DPART07.OUT)
* NOT TO SCALE. LOCATIONS ARE APPROXIMATE.

GENERAL GROUND WATER FLOW

CHARACTERISTICS OF KEY FERNALD CONTAMINANTS

KEY CONTAMINANTS	CHARACTERIZATION OF THREAT	HALF-LIFE OR PERSISTENCE	BACKGROUND LEVELS[A]	LEGAL STANDARDS: DRINKING WATER	LEGAL STANDARDS SOIL/OTHER
Uranium	Cancer of the lung and lymphoma; kidney toxicity	^{238}U = 4.5 billion years, decays to lead	^{238}U(+ 2 progeny) = 1.22 pCi per gram of soil	(Proposed)[b]: 20 µg U_{total} per liter (parts per billion) of water (30 pCi per liter)[f]	
Thorium	Cancer of the bone and liver	^{228}Th = 1.91 years ^{232}Th = 14.1 billion years	^{228}Th = 1.43 pCi/g	(Current)[c]: 15 pCi gross alpha activity per liter of water (excluding Rn and U)	
Radium	Cancer of skin and bones	^{226}Ra = 1602 years ^{228}Ra = 6.7 years	^{226}Ra (+5 progeny) = 1.45 pCi/g ^{228}Ra (+1 progeny) = 1.19 pCi/g	(Current): 5 pCi per liter total Radium. (Proposed): 20 pCi per liter each (^{226}Ra and ^{228}Ra)	Soil: 5 pCi total radium per gram (surface) and 15 pCi radium per gram (subsurface)[d]
Radon	Cancer of the lungs	^{222}Rn Effective-Half-Life=30 minutes		(Proposed): 300 pCi radon per liter of water	Air: 20 pCi/-m^2-s emission rate per source[e] (e.g., K-65 silos)
Asbestos	Cancer, asbestosis	Sable		(Current): 7 million fibers per liter	NESHAP-No visible emissions; OSHA PEL-0.2 fibers per cc[g]
Arsenic	Skin cancer (ingestion) lung cancer (inhalation)[h]	Stable	8.45 mg/kg	(Current[c] - under review): 0.05 mg per liter (50 ppb)	
Beryllium	Dermatitis, acute pneumonitis, probable human carcinogen	Stable	0.6 mg/kg	(Current)[c]: 0.004 mg/l (4 ppb)	
Cadmium	Kidney/liver toxicity	Stable	0.82 mg/kg	(Current)[c]: 0.005 mg/l (5 ppb)	
Cobalt	Allergen, pneumoconiosis	Stable			
Organics (e.g., PCB's, PAH's)	Cancer of the skin and stomach	Very persistent	0.00 mg/kg[f]	Chemical specific	

*Footnotes are on the back

INTRODUCTION TO RISK ASSESSMENT

WHAT IS RISK	Risk is the potential for negative health impact as a result of exposure to contamination. Health impacts are generally classified as carcinogenic or toxic. Carcinogenic risks are quantified as the risk of contracting cancer over a lifetime and are usually stated in exponential notation. For example, a risk of 10^{-6} means that there is a one in one million chance that an individual exposed to a certain contamination at a certain level over a lifetime would contract cancer. Current Superfund regulations consider the range of 10^{-4} to 10^{-6} excess lifetime risk of cancer to be acceptable. Toxic health impacts are non-cancerous illnesses and are quantified using a health index. A health index of 1 or above is considered hazardous. Calculations of risk are used to identify threats and calculate cleanup levels.
HOW RISK IS MEASURED	Risk is a function of how much of a contaminant is present (dose), how dangerous a chemical is to humans (toxicity), how the chemical enters the body (method of exposure), and how often a person is exposed to the chemical (level of exposure): **RISK = DOSE x TOXICITY x METHOD OF EXPOSURE x LEVEL OF EXPOSURE**
DOSE	The dose of a contaminant is represented as the concentration of the compound of concern at the point of human contact. These concentrations may be present in soil, sediments, surface water, ground water, or air. If human contact occurs in more than one of these media, the dose in each case must be taken into account to identify the cumulative risk from the contaminant.
TOXICITY	The U.S. EPA and other government programs have calculated the toxicity of many hazardous compounds. Much of this information is gained from statistical evidence from laboratory tests on animals. Not all compounds have well understood toxicity values. Special consideration is given to receptors that may be especially susceptible to the toxic effects such as children or pregnant women.
METHOD OF EXPOSURE	Exposure to contamination may occur from many pathways including direct ingestion from air inhalation, water consumption, accidental consumption of soil or wind blown particulates, or eating contaminated foods. Exposure can also occur through direct contact with contaminants resulting in radiation or dermal (skin) absorption.
LEVEL OF EXPOSURE	The level of exposure is defined by the activities taking place at the point of exposure. Components of the level of exposure include the amount of time (e.g., hours per day of direct exposure), or volume (e.g., liters of water consumed per day).

FERNALD CITIZENS TASK FORCE

RISK OVERVIEW

Risk to human health from the Fernald site results from the potential exposure to hazardous materials that were used during the processing of uranium and other site activities. Materials are considered hazardous if they exhibit one or more of the following traits:

Carcinogenic: resulting in cancer through continued exposure.

Flammable or Explosive: unstable or easily ignited presenting high risks of burns and loss of life.

Corrosive: causing major irritation or damage to body tissues.

Toxic: causing non-cancer illnesses or death.

Hazardous materials have entered the environment surrounding the Fernald production area through airborne distribution, surface runoff, and infiltration to soils and groundwater. Exposure can occur through a number of different routes, all of which must be considered in the evaluation and cleanup of the site:

Inhalation: Contaminants that are suspended in air can be transported by wind and are susceptible to inhalation by humans. Suspension of contaminants was common during operations at Fernald and account for much of the soil contamination away from the production area, however, most radioactive materials at Fernald are relatively heavy and fall out of the air after short distances. Resuspension of contamination will occur during excavation activities during cleanup and controlling this phenomenon will be a significant aspect of all cleanup plans.

Ingestion: The most prominent pathway for ingestion of contaminants at Fernald is from drinking contaminated water from the Great Miami Aquifer. Ingestion of contaminants can also occur from the inadvertent ingestion of contaminated soils or foods.

Direct Contact: Direct contact with some contaminants can cause problems through skin adsorption or skin irritation, however, for most contaminants of concern at Fernald this is not considered to be a problem.

The predominant contaminant of concern at Fernald is the radioactive material uranium, however, there are other hazardous chemicals and materials on site. Three major classes of hazardous materials on site include radionuclides, chemical toxins, and asbestos.

EXPOSURE TO RADIONUCLIDES

Some radionuclides may present risk from chemical toxicity, however, it is the risk of cancer from exposure to radiation that usually dominates risk assessments. Radioactivity occurs when an unstable atom spontaneously decays. This decay can result in three different types of radiation. Not all compounds emit all three types of radiation. Some radioactive materials must be taken inside the body for exposure to radiation to occur while some may occur even when the radioactive materials

are outside the body as described below. Radiation from 238uranium decay is predominantly particulate (alpha and beta) with a relatively small percent abundance of gamma emitters.

Alpha Particles (radiation) outside the body cannot penetrate through the outer, dead, layer of skin. However, once inside the body, alpha radiation poses a much higher risk than beta or gamma radiation.

Beta Particles (radiation) cannot penetrate from outside the body to the internal organs and is, therefore, only a threat to shallow tissues such as the skin and outer eyes (cornea) unless ingested. The most energetic beta particles in the uranium decay series cannot travel more than 30 feet in air.

Gamma Rays (radiation) have the characteristic of traveling long distances and penetrating deeply into matter. Gamma radiation can penetrate deep into body tissues and cause injury to internal organs.

EXPOSURE TO CHEMICAL TOXINS

Most chemical toxins present at Fernald must be taken into the body for adverse health effects to occur, however chemicals are present on site representing each of the hazards identified above. Chemicals may enter the body through inhalation, ingestion, injection, and by absorption through the skin.

EXPOSURE TO ASBESTOS CONTAINING MATERIAL (ACM)

Asbestos is a strong, incombustible fiber widely used in the past for fireproofing and insulation. Asbestos-containing materials (ACM) utilized at Fernald includes transite wall and roof panels, some floor tiles, pipe insulation, and loose insulation. Inhalation is the primary route of exposure for asbestos. The term "friable" is often used to identify materials which present a high potential to generate airborne concentrations of asbestos. Friable means capable of being crumbled, pulverized, or reduced to powder by hand pressures. The small, buoyant fibers are easily inhaled or swallowed, causing a number of serious diseases including: asbestosis, a chronic disease of the lungs that makes breathing more and more difficult; and two forms of cancer (1) mesothelioma, a cancer (specific to asbestos exposure) of the membranes that line the chest and abdomen, and (2) bronchogenic carcinoma, a malignancy of the interior of the lung.

EXPOSURE TO MULTIPLE CONTAMINANTS

Interactions between two hazardous materials may have widely varying effects on their combined threat to human health. Some chemicals may be synergistic, resulting in an increased hazard, while others may be antagonistic, actually reducing the hazard when both are present. Current risk science has not fully characterized the relationships between different chemicals and thus these results have not been been adequately quantified for use in risk assessments. At Fernald, risk characterization does not consider antagonistic or synergistic effects and an assumption of additivity is made.

SIGNIFICANT PATHWAYS AND RECEPTORS FOR CONTAMINATION AT FERNALD

PATHWAY	ON-PROPERTY RESIDENTS	OFF-PROPERTY RESIDENTS	VISITOR	GROUNDS KEEPER	TRESPASSER	GMR USER	HOME BUILDER	OFFSITE USER OF MEAT/ MILK PRODUCTS
Inhalation of Dusts	Yes	Yes	Yes	Yes	Yes		Yes	
Inhalation of Radon	Yes							
Ingestion of Soil/Sediment	Yes			Yes	Yes	Yes	Yes	
Ingestion of Drinking Water	Yes	Yes						
Dermal Contact with Soil/Sediment	Yes			Yes	Yes	Yes	Yes	
Irradiation from Soils and Sediments (Outdoors)	Yes		Yes	Yes	Yes	Yes	Yes	
Ingestion of Homegrown Fruits and Vegetables	Yes	Yes						
Ingestion of Meat and Milk	Yes	Yes						Yes

SHORT-TERM RISK SUMMARY

SOURCE	CONSEQUENCES	RECEPTOR	PATHWAYS	MITIGATION TECHNIQUES	MITIGATION EFFECTIVENESS
Waste hauling vehicles	Physical effects[a]	Public along the transportation route	Public highways and railways	Minimize off-site shipments, use alternative conveyance	Transfers risk to other receptors, pathways, and time frames; high-volume conveyance may reduce risk
Waste handling equipment and material	Physical effects[a]	On-site and off-site workers	All related activities	Engineering controls, safety training, minimize distance	Real reduction in risk; minimizing waste volume changes short-term to long-term problem
Resuspended material and contaminated soil, radon	Increased cancer risk from inhalation of radionuclides	On-site nonremediation worker, near-property resident	Inhalation	Dust control: capture; removal; suppression and encapsulation	Feasibility and effectiveness depends on project size and duration
Handling of radioactive material and contaminated wastes on site	Increased cancer risk from radiation	On-site remediation worker	Inhalation, direct contact	Engineering controls, minimize distance, shielding	Real reduction of risk, consistent with occupational health and safety
Handling of radioactive material and contaminated wastes off site	Increased cancer risk from radiation	Off-site workers and public along transportation route	Inhalation, direct contact	Reduced volume of off-site disposal	Transfers risk to other receptors, pathways and time frames
Resuspended contaminated soil/materials, volatile chemicals	Increased cancer risk from chemical inhalation	On-site nonremediation worker, near property resident	Inhalation (no respiratory protection device)	Control of fugitive emissions, capture; suppression, and encapsulation	Feasibility and effectiveness depends on project size and duration
Resuspended contaminated soil/materials, volatile chemicals	Chemical toxicity	On-site remediation workers, near-property resident	Inhalation (no respiratory protection device)	Control of fugitive emissions, capture; suppression, and encapsulation	Feasibility and effectiveness depends on project size and duration
Removal of asbestos-containing material	Increased risk of asbestosis and cancer	On-site remediation worker	Inhalation	Engineering controls, personal protective equipment, training	Able to reduce risk to acceptable levels

a Physical effects include injuries and fatalities and are assumed to be proportional to the number of hours that an activity is performed. Historical data indicates the risk of fatalities is much lower than the risk of injuries.

MAJOR AREAS OF CONTAMINATION AT FERNALD

COMPONENTS	DESCRIPTION	PATHWAYS AND CONTAMINANTS OF CONCERN[a]	LEADING REMEDIAL ALTERNATIVE
Pit Sludges (OU1)	Contents of waste pits 1 through 6 and the Clearwell plus cap and liner materials in direct contact with waste; sludges generated in the AWWT (similar characteristics to waste pit sludges)	Ingestion of water from the Great Miami Aquifer (GMA) provides the largest contribution to overall risk for both carcinogens and chemical toxicants. The total carcinogenic risks are approximately 1 in 10 (10^{-1}) for all exposure routes. Ingestion of groundwater containing metals (arsenic) and ^{238}uranium contributes almost half of this receptor's total risk followed by external exposure to surface soils/pit materials and inhalation of dust. Uranium and thorium isotopes and arsenic are the major carcinogens for these exposure pathways. Other pathways with cancer risk exceeding 1 in 10,000 (10^{-4}) or hazard quotient greater than 1 include: ingestion of food affected by dust; direct contact with soils and pit materials; domestic and agricultural use of groundwater; and ingestion of meat and dairy products from cows grazed and watered on-site.[b]	Removal, treatment (thermal drying) and Off-site disposal at permitted facility
Flyash Piles (OU2)	OU2 consists of the following subunits: the Active Flyash Pile, South Field, Inactive Flyash Pile, lime sludge, and solid waste landfill	The highest total carcinogenic risk (RME on-property farmer) for all of Operable Unit 2 is about 1 in 270 (3.7×10^{-3}). The risks and hazards from OU2 result primarily from the three subunits which contribute most to the ground water contamination (i.e., Active Flyash Pile, South Field, and Inactive Flyash Pile). The major pathway for the carcinogenic risk is soil containing ^{228}thorium, ^{228}radium, and beryllium. The second major pathway is ingestion of water from the Great Miami Aquifer due to the presence of ^{238}uranium.[c]	Off-site disposal of Thorium- Radium contaminated materials and In-Situ or other on-site containment for low hazard waste
Total Soils (all OUs)	Contaminated soils and rubble amenable to or requiring decontamination by treatments such as soil washing prior to disposition (i.e., Soil under OU1 waste pits, waste and contaminated soil excavated from OU2, soil and rubble from OU3, soil from OU4 and OU5)	If this material is treated as proposed, the primary risk will be from airborne dust generated during excavation. The contaminants of concern in soils under the waste pits should be the same as those which leach into the GMA (i.e., arsenic and uranium). For OU2 wastes, the most likely contaminants of concern are ^{228}thorium, ^{228}radium, ^{238}uranium, arsenic, and beryllium. Soil and rubble from OU3 is not well characterized at this time. Contaminants of concern will probably include radium, thorium, uranium, and miscellaneous organics. For OU4 and 5 soils, cancer and noncancer risk are highest to the on-property farmer. The cancer risk for this individual is about 1 in 15 (6.5×10^{-2}) with uranium and arsenic being the contaminants of concern. The primary chemical toxicant is also uranium with a Hazard Index of 270.	Deferred to OU5 Feasibility Study/Proposed Plan

a The information in this column is taken the exposure assessment for the on-property reasonable maximum exposure (RME) resident farmer

b REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 1, Volume 5, Appendix E, section E.7.1

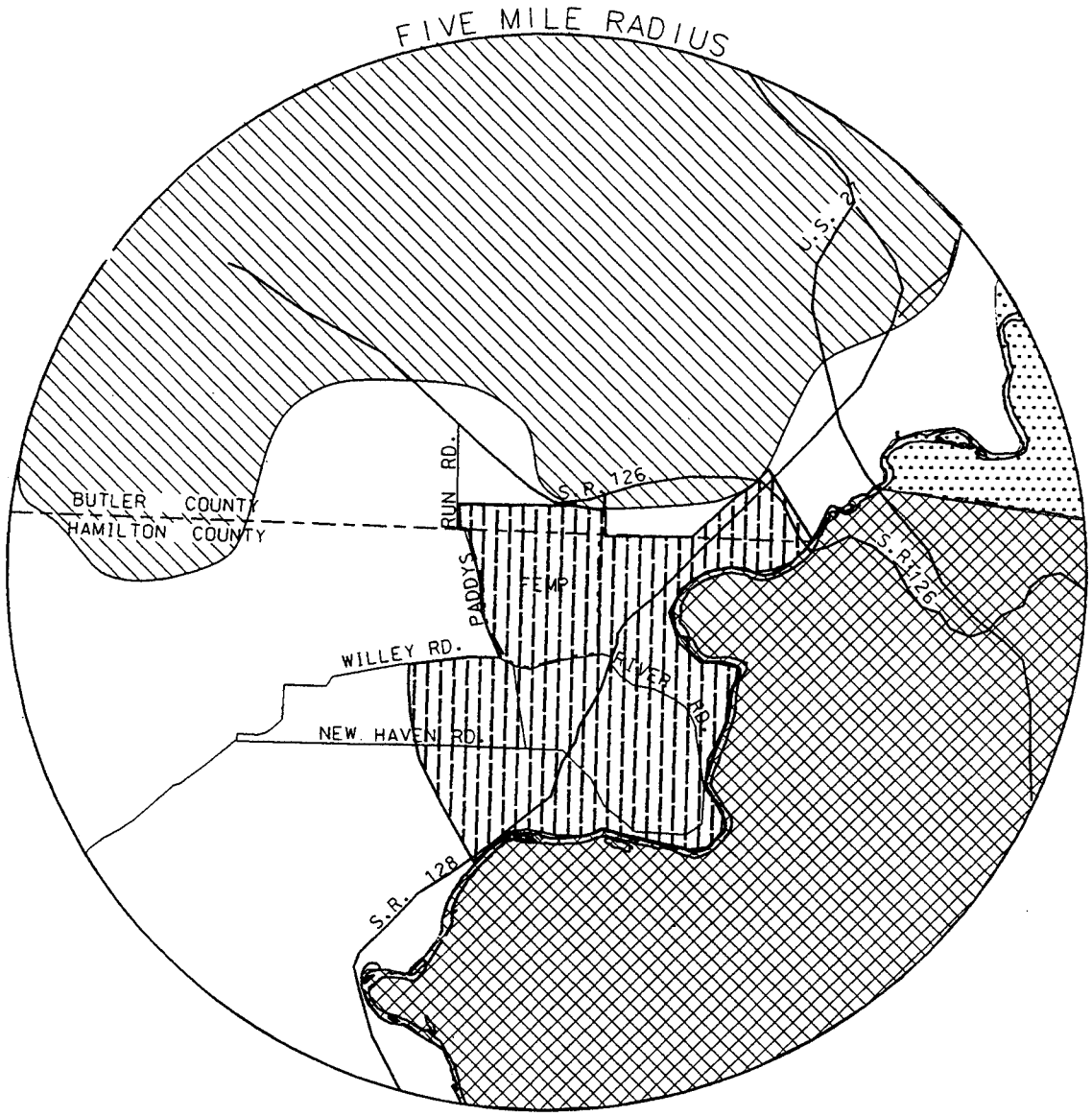
c REMEDIAL INVESTIGATION REPORT FOR OPERABLE UNIT 2, Volume 4, Section 6.3.6, Operable Unit 2 Cumulative Risk

KEY CHARACTERISTICS OF LEADING REMEDIAL ALTERNATIVES FOR SOURCE COMPONENTS

COMPONENT	DISPOSAL VOLUME (yd^3)	WASTE MANAGEMENT METHOD	OFF-SITE DISPOSAL (yd^3)	OFF-SITE DISPOSAL (Truckloads)[a]	ON-SITE STORAGE (yd^3)	ON-SITE STORAGE (Acres)[b]	COST ($1,000)
Pit Sludges (OU1)[c]	780,000	Off-Site Disposal at Envirocare	780,000	39,000	0	0	$513,050
Flyash Piles (OU2)[d]	250,300	On-Site Disposal	3,600[e]	180	246,700	10	$64,429
K-65 Wastes (OU4)[f]	13,995	Vitrify/Off-Site Disposal at NTS	13,995	700	0	0	$101,052
Structural Debris (OU3, OU4)	114,511	On-Site Disposal	0	0	114,511	5	$41,678
Transite (OU3)	1,800	On-Site Disposal	0	0	1,800	0.1	$655
Misc. equipment (OU3)	86,066	On-Site Disposal	40,930	2,047	45,136	2	$49,829
Steel (OU3)	2,242	Recycle and On-Site Disposal	7,700	112	0	0	$1,830
TOTALS			846,225	42,039	408,147	17.1	$772,523
Off-Site Soil Volumes at 10^{-5}	190,000	On-Site Disposal				8	$69,160
Off-Site Soil Volumes at 10^{-6}	5,200,000	On-Site Disposal				208	$1,892,800

a assumes 20 yd^3 per truckload
b assumes 25,000 yd^3 per acre
c includes soils from cap and liner
d includes the solid waste landfill, lime sludge ponds, active and inactive flyash piles
e includes waste that does not meet waste acceptance criteria for on-site cell
f includes bentonite grout, sludge, dry waste and water.

MAJOR WATER USERS WITHIN FIVE MILE RADIUS



SCALE

9000 4500 0 9000 FEET

LEGEND:

- AREA WITHOUT WATER SERVICE
- SOUTHWEST REGINAL WATER DISTRICT
- CINCINNATI WATER WORKS (CWW)
- NEW SERVICE AREA (CWW)
- FAIRFIELD WATER DISTRICT
- FEMP BOUNDARY

DRAFT

FERNALD CITIZENS TASK FORCE

POPULATIONS AND DEMOGRAPHICS OF SURROUNDING COMMUNITIES

The Fernald site is located is two Ohio counties, Hamilton and Butler, and their combined population is 1.2 million people. Hamilton County has about 866,228 people, while Butler County has a population of 291,479. Most of the communities surrounding the Fernald site are unincorporated towns varying from an estimated population of 20 in Fernald proper to about 6,383 in Ross. Most of the communities have been characterized as agricultural or as "bedroom communities" for commuters in the Greater Cincinnati area.

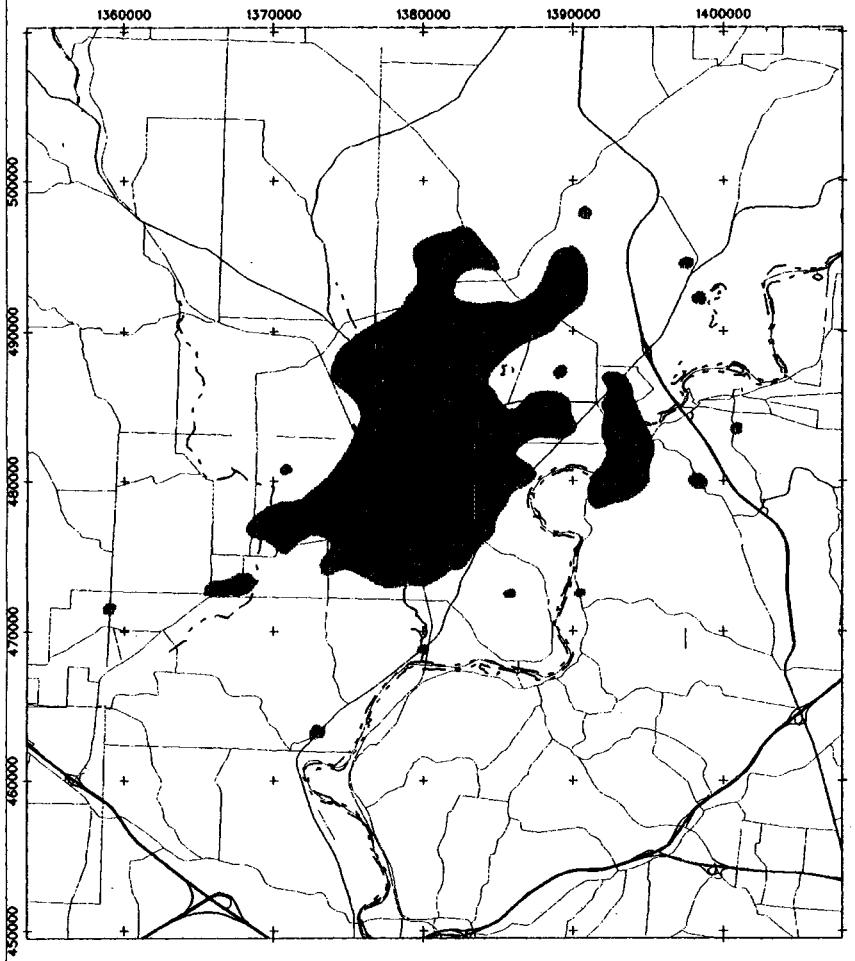
The area immediately in the vicinity of Fernald is racially and ethnically homogenous. There is no appreciable minority population in the rural area around Fernald. The nearest city to Fernald is Harrison, which is about 8 miles from the site. According to the Census, there are about 4 African-Americans, 7 Native Americans, and 27 people of Hispanic origin living in Harrison - or about .5 percent of the total population. There are 13,134 African-Americans and 1,467 people of Hispanic origin living in Butler County, but they reside predominately in or near the City of Hamilton, beyond a 12-mile radius from the Fernald facility. To date these communities have not shown an interest in Fernald. Hamilton County has a substantial minority population, but it is centered in the City of Cincinnati and its suburbs. The nearest historically black college is over 150 miles away. Native American lands or significant historical sites are not implicated at Fernald.

The average income for residents of Butler County is $21,772, while it is $22,959 for Hamilton County residents. The unemployment rate for Butler and Hamilton counties, respectively, is 6.6 and 4.5 percent. In Butler County, about 30 percent of the employed work as professionals; the percentage is 34.6 percent for Hamilton County. The remainder of the work force in these counties is employed predominately in the manufacturing and service sectors. About 10 percent of the population in Butler County lives below the poverty level; it is 13.3 percent in Hamilton County. According to the Census, 18.7 percent of the population in Butler County has attended school for 16 years or more, and about 76 percent of the population has had 12 years or more. 23.7 percent of the residents in Hamilton County have had 16 years or more of school, and 75.6 percent have had 12 years or more.

COMMUNITY	POPULATION	CAUCASIAN	AFRICAN-AMERICAN	OTHER[1]	MEDIAN HOUSEHOLD INCOME
Hamilton County	866,228	77.7%	20.9%	1.4%	$29,498
Cincinnati	364,040	60.5%	37.9%	1.6%	$21,006
Crosby Township	2,665	99.6%	.4%		$28,706
New Baltimore[2]	350				
Fernald[2]	20				
New Haven[2]	300				
City of Harrison	7,528	99%	.0004%	.001%	$33,866
Butler	291,479	94%	5%	1%	$32,440
Morgan Township	4,972	99.5%	.001%	.004%	$39,247
Ross Township	6,383	99.5%	.1%	.4%	$38,680
Ohio-Kentucky-Indiana Region	1.7 Million				

1 Includes Native Americas, Hispanics
2 Demographic breakdowns not available

OFF-SITE SOILS REQUIRING REMEDIATION AT 10^{-6} RISK

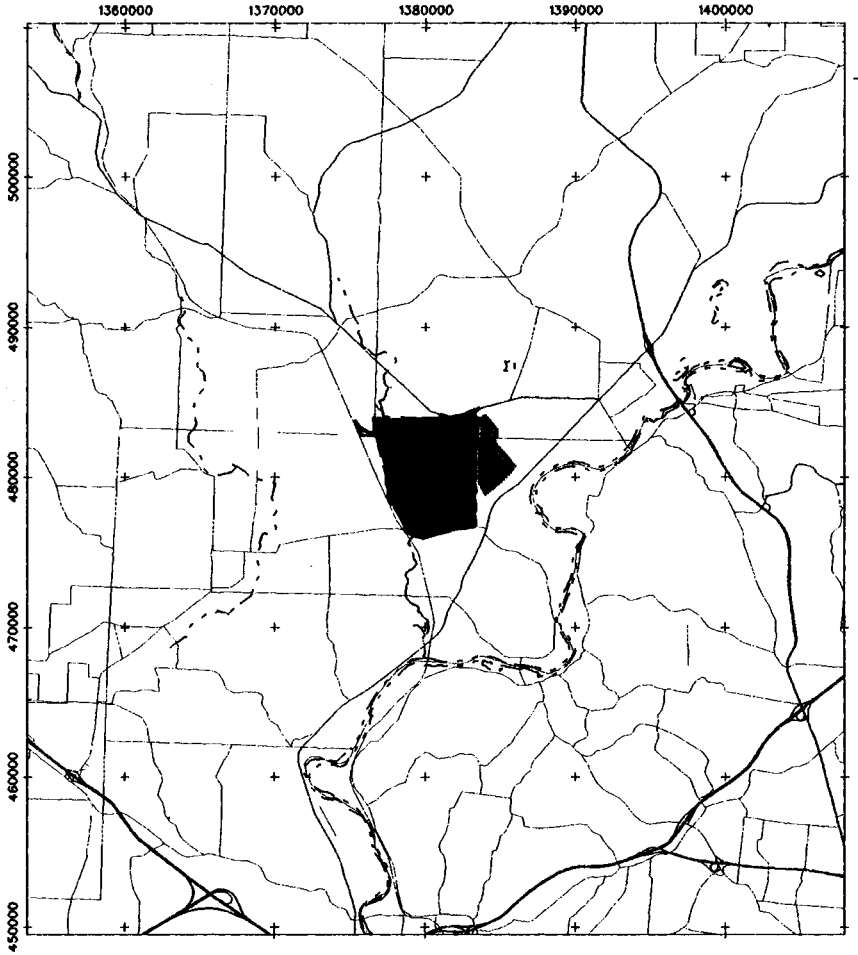


LEGEND:

10^{-6} RISK EXCAVATION FOOTPRINT (5,020,000 yd.^{3})

FEMP BOUNDARY

OFF-SITE SOILS REQUIRING REMEDIATION AT 10^{-5} RISK



LEGEND:

10^{-5} RISK EXCAVATION FOOTPRINT (190,000 yd.^{3})

FEMP BOUNDARY

SCALE

9000 4500 0 9000 FEET

KEY ISSUES FOR GROUNDWATER REMEDIATION

ISSUE		AT 20 ppb (MCLs)	AT 3 ppb (10^{-6} risk)
Current Impact of Fernald on GMA	Gallons	1.7 billion	5.8 billion
	% of Total GMA	0.018 %	0.062%
Projected conditions if soil is removed (without groundwater treatment)	10 years	2.1 billion	6.8 billion
	25 years	2.5 billion	8.1 billion
	50 years	2.7 billion	9.9 billion
Projected conditions if soil is not removed (without groundwater treatment)	10 years	2.1 billion	6.8 billion
	25 years	2.6 billion	8.1 billion
	50 years	3.4 billion	11 billion
	1000 years	23 billion	32 billion
Current areal impact of contamination	acres	n/a	1,500
	residential wells	n/a	9
	industrial wells	n/a	8
	total households	n/a	19
	total businesses	n/a	7
Projected maximum areal impact of contamination	acres	n/a	4,200
	residential wells	n/a	58
	industrial wells	n/a	26
	total households	n/a	403
	total businesses	n/a	25
Time to reach cleanup levels if source soils are removed	Full pump & treat	35 years	70 years
	South plume wells	90 years	350 years
	No pumping	160 years	500 years
Time to reach cleanup levels if source soils are not removed		thousands of years	thousands of years
Time until contamination reaches the Great Miami river without pumping		140 years	40 years
Cost of Groundwater Cleanup (assumes soil is remediated)	Begin today	$396 million	$800 million
	Begin in 10 years	$485 million	$952 million
	Begin in 25 years	$590 million	$1.12 billion
	Begin in 50 years	$644 million	$1.4 billion
	Property purchase	$750 million	$750 million

FERNALD CITIZENS TASK FORCE

FUTURE USE SCENARIOS DEVELOPED FOR EVALUATION

Cleanup levels used in developing scenarios were based on one of four land use categories or protection of groundwater as identified below:

FUTURE USE CATEGORY	EXPOSURE ASSUMPTIONS	LEVELS AT 10^{-4} RISK	LEVELS AT 10^{-5} RISK	LEVELS AT 10^{-6} RISK
Resident Farmer	Assumes full-time life-long resident growing crops for human consumption and grazing livestock.	130 ppm	15 ppm	5 ppm
Industrial	Assumes maximum exposure to on-site groundskeeper.	1200 ppm	125 ppm	15 ppm
Developed Park	Assumes free access recreational facility with developed sports, picnic, and rest room facilities.	3490 ppm	350 ppm	40 ppm
Green Space	Assumes unlimited access to nature trails, but with no developed facilities.	8820 ppm	885 ppm	90 ppm
Zone I GMA Protection	Assumes soil concentrations required to prevent contamination leaching into aquifer.	10^{-4} does not Protect GMA	20 ppm	5 ppm
Zone II GMA Protection	Assumes soil concentrations required to prevent contamination leaching into aquifer.	10^{-4} does not Protect GMA	100ppm	10 ppm

A Total of 9 scenarios were developed for evaluation as a result of the Future Site exercise and protection of the aquifer. Most of the scenarios follow the cleaner border concept which emerged from the FutureSite exercise. Volumes and costs for these scenarios were developed at 10^{-4}, 10^{-5}, and 10^{-6} risk levels. The scenarios are listed below and are compared in the table on pages X-3 through X-9 along with groundwater protection options 10a, 10b, and 10c and off-site soil cleanup requirements at 10^{-5} and 10^{-6} risk levels. Maps and excavation profiles of selected scenarios begin on page X-10.

Scenario 1 Resident Border/Industrial Center
Scenario 2 Resident Border/Park Center
Scenario 3 Resident Border/Green Space Center
Scenario 4 Industrial Border/Park Center
Scenario 5 Industrial Border/Green Space Center
Scenario 6 Park Border/Green Space Center
Scenario 7 Total Green Space
Scenario 8 North Green Space/South Industrial
Scenario 9 Total Resident
Scenario 10 Protection of Aquifer to MCLs
Scenario 10a Protection of Aquifer and Perched Groundwater to MCLs
Scenario 10b Protection of Aquifer to 10^{-6}

COMPARISON OF FUTURE USE SCENARIOS

SCENARIO	VOLUME OF ON-SITE SOILS (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE (millions)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Scenario 1 at 10^{-4}: Resident/ Industrial	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 1 at 10^{-5}: Resident/ Industrial	835,000	33	41,750	121	$150	Does not protect GMA. 794,000 yd^3 additional soil removal required.	Disrupts 646 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 1 at 10^{-6}: Resident/ Industrial	2,033,000	105	101,650	296	$600	Does not protect GMA. 1,976,000 yd^3 additional soil removal required.	Disrupts 1008 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 2 at 10^{-4}: Resident/ Park	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 2 at 10^{-5}: Resident/ Park	835,000	33	41,750	121	$150	Does not protect GMA. 794,000 yd^3 additional soil removal required.	Disrupts 646 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 2 at 10^{-6}: Resident/ Park	1,768,000	71	88,400	256	$500	Does not protect GMA. 2,208,000 yd^3 additional soil removal required.	Disrupts 1008 acres of terrestrial habitat and 35.9 acres of wetlands

COMPARISON OF FUTURE USE SCENARIOS (continued)

SCENARIO	VOLUME OF ON-SITE SOILS (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE ($1,000)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Scenario 3 at 10^{-4}: Resident/ Green Space	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 3 at 10^{-5}: Resident/ Green Space	835,000	33	41,750	121	$150	Does not protect GMA. 794,000 yd^3 additional soil removal required.	Disrupts 646 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 3 at 10^{-6}: Resident/ Green Space	1,719,000	69	85,950	249	$460	Does not protect GMA. 2,290,000 yd^3 additional soil removal required.	Disrupts 1008 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 4 at 10^{-4}: Industrial/ Park	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 4 at 10^{-5}: Industrial/ Park	694,000	28	34,700	100	$125	Does not protect GMA. 775,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 4 at 10^{-6}: Industrial/ Park	889,000	35	44,450	129	$150	Does not protect GMA. 2,492,000 yd^3 additional soil removal required.	Disrupts 1008 acres of terrestrial habitat and 35.9 acres of wetlands

COMPARISON OF FUTURE USE SCENARIOS (continued)

SCENARIO	VOLUME OF ON-SITE SOILS (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE ($1,000)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Scenario 5 at 10^{-4}: Industrial/ Green Space	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 5 at 10^{-5}: Industrial/ Green Space	694,000	28	34,700	100	$125	Does not protect GMA. 775,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 5 at 10^{-6}: Industrial/ Green Space	841,000	34	42,050	122	$150	Does not protect GMA. 2,481,000 yd^3 additional soil removal required.	Disrupts 1000 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 6 at 10^{-4}: Park/ Green Space	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 6 at 10^{-5}: Park/ Green Space	694,000	28	34,700	100	$125	Does not protect GMA. 775,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 6 at 10^{-6}: Park/ Green Space	705,000	28	35,220	102	$125	Does not protect GMA. 2,617,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands

COMPARISON OF FUTURE USE SCENARIOS (continued)

SCENARIO	VOLUME OF ON-SITE SOILS (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE ($1,000)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Scenario 7 at 10^{-4}: Total Green Space	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 7 at 10^{-5}: Total Green Space	694,000	28	34,700	100	$125	Does not protect GMA. 775,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 7 at 10^{-6}: Total Green Space	700,000	28	35,000	78	$125	Does not protect GMA. 2,622,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 8 at 10^{-4}: North Green South Indust.	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 8 at 10^{-5}: North Green South Indust.	694,000	28	34,700	100	$125	Does not protect GMA. 775,000 yd^3 additional soil removal required.	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 8 at 10^{-6}: North Green South Indust.	1,127,000	45	56,350	163	$225	Does not protect GMA. 2,195,000 yd^3 additional soil removal required.	Disrupts 789 acres of terrestrial habitat and 11.4 acres of wetlands

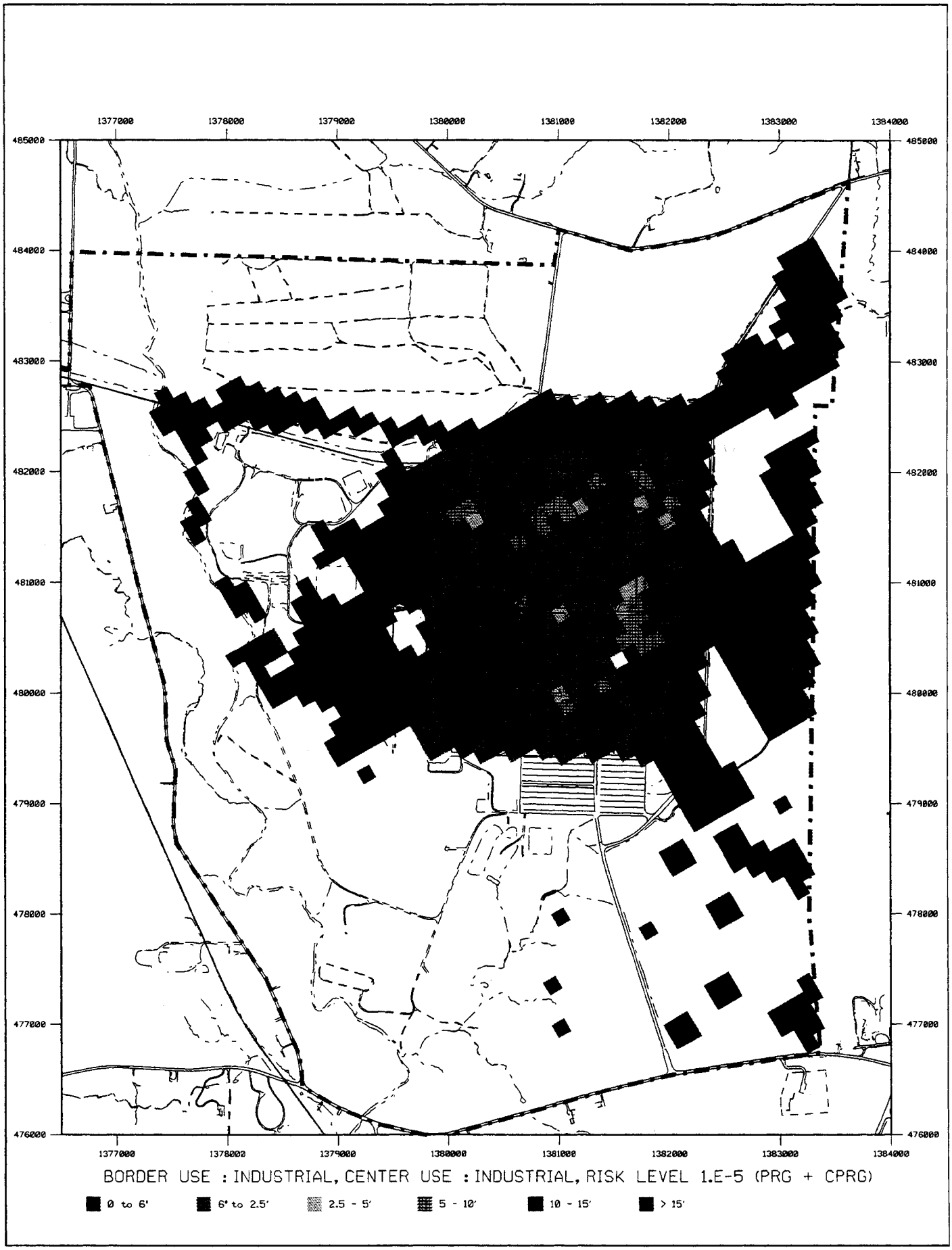
COMPARISON OF FUTURE USE SCENARIOS (continued)

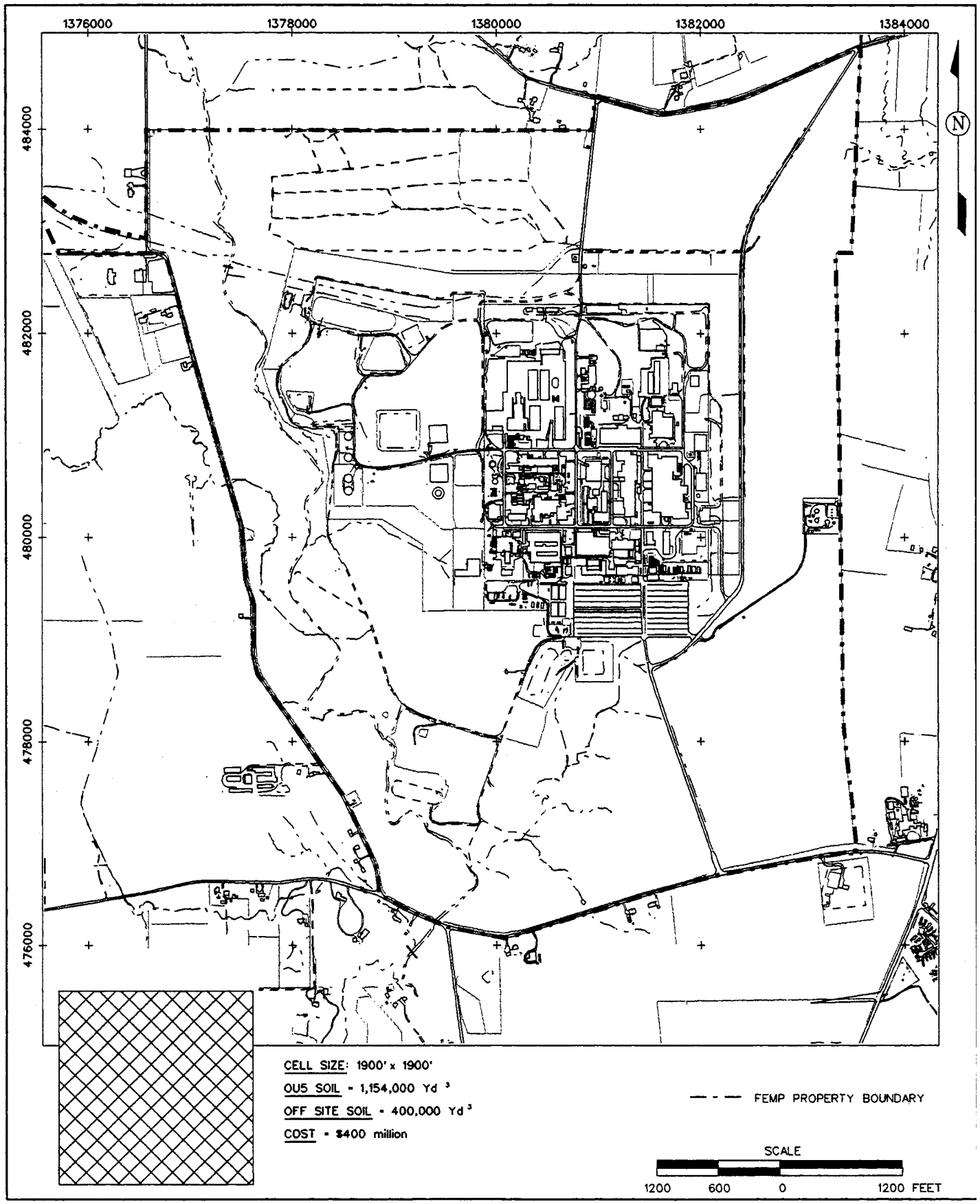
SCENARIO	VOLUME OF ON-SITE SOILS (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE ($1,000)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Scenario 9 at 10^{-4}: Total Resident	694,000	28	34,700	100	$125	GMA protection to drinking water standards is not achieved at 10^{-4}	Disrupts approx. 500 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 9 at 10^{-5}: Total Resident	1,154,000	46	57,700	167	$265	Protective of GMA but 835,000 yd^3 of additional soil removal required.to protect perched groundwater	Disrupts over 650 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 9 at 10^{-6}: Total Resident	3,618,000	145	180,900	524	$1,600	Protective of GMA but 652,000 yd^3 of additional soil .to protect perched groundwater	Disrupts over 1,000 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 10: Protect GMA to MCLs	1,114,000	45	55,700	161	$250	Protective of GMA.to MCLs	Over 650 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 10a: Protect GMA and perched to MCLs	1,503,000	60	75,150	218	$380	Protective of GMA and perched gw to MCLs.	Over 650 acres of terrestrial habitat and 35.9 acres of wetlands
Scenario 10b: Protect GMA to 10^{-6} risk	3,385,000	135	169,250	490	$1,400	Protective of GMA and perched groundwater to 10^{-6}	Over 1,000 acres of terrestrial habitat and 35.9 acres of wetlands

COMPARISON OF FUTURE USE SCENARIOS (continued)

	VOLUME OF SOIL (yd^3)[a]	ACRES OF CELL IF TOTAL ON SITE[b]	# TRUCKS IF TOTAL OFF SITE[c]	# TRAINS IF TOTAL OFF SITE[d]	TOTAL COST IF ON SITE ($1,000)	AQUIFER PROTECTION	NATURAL RESOURCE PROTECTION[e]
Off-site Soil Removal to Achieve Resident Farmer at 10^{-5}	190,000	8	9,500	28	$50	Protective of GMA	236 acres of terr. habitat and unknown acres of wetlands
Off-site Soil Removal to Achieve Resident Farmer at 10^{-6}	5,200,000	208	260,000	754	$2,100	Protective of GMA	6,474 acres of terr. habitat and unknown acres of wetlands

Notes
a) Includes all soils and debris from all QUs for on-site disposal
b) 25,000 yd^3 per acre
c) 20 yd^3 per truck
d) Approximately 6,900 yd^3 per 130 unit train
e) All scenarios present potential impacts to Paddys Run and threatened and endangered species


1377000
1378000
1379000
1380000
1381000
1382000
1383000
1384000
485000
484000
483000
482000
481000
480000
479000
478000
477000
476000
BORDER USE : INDUSTRIAL, CENTER USE : INDUSTRIAL, RISK LEVEL 1.E-5 (PRG + CPRG)
0 to 6'
6' to 2.5'
2.5 - 5'
5 - 10'
10 - 15'
> 15'



BORDER USE: RESIDENTIAL, CENTER USE: RESIDENTIAL, RISK LEVEL: 1.E-5 (PRG ONLY)

FERNALD CITIZENS TASK FORCE

OPTIONS FOR WASTE DISPOSITION

	ON SITE	OFF SITE	TREATMENT
REQUIRE-MENTS	Protection of GMA for 1000 years. State and Federal design requirements Waiver from State siting regulation Aesthetically acceptable	Assurance of avaialable capacity Transportation regulations Citizen/political acceptance along route and at disposal facility Receiving facility waste acceptance criteria	Treated material must meet cleanup criteria State and Federal regulations for design and operation Treatment process cannot be reversible Generated wastes must be manageable
OPTIONS	Cap materials in place (without liner) Consolidate and cap materials (without liner) Disposal facility with liner and cap	Nevada Test Site Envirocare of Utah	Soil washing with release of the clean portion Soil washing with consolidation of the clean portion
OPTIONS THAT MEET REQUIRE-MENTS	Disposal Facility (assuming waiver from State siting requirements)	Nevada Test Site Envirocare of Utah	No treatment option is available Treatment options being pursued as potential waste minimization tool in conjunction with on- or off-site disposal
DESCRIPTION	Multi-layer cap and liner Above ground disposal Gradual slope to minimize erosion On best available geology Federal ownership Long-term monitoring	Majority of material to Envirocare via bulk rail transport Containerized truck transport to NTS for wastes that do not meet Envirocare criteria	

FERNALD CITIZENS TASK FORCE

SUMMARY OF ON-SITE AND OFF-SITE DISPOSAL OPTIONS

	ON SITE	OFF SITE
COST	Unit Cost: $175/cubic yard Volume 2.4 million cubic yards Total Cost $420 million Annual O&M $1.4 million	<u>Nevada Test Site</u> Unit Cost: $1440/cubic yard Volume 2.4 million cubic yards Total Cost $3.46 billion <u>Envirocare</u> Unit Cost: $530/cubic yard Volume 2.4 million cubic yards Total Cost $1.27 billion
TIME TO IMPLEMENT	Approximately 20 years (linked to building demolitions).	Approximately 20 years (linked to building demolitions).
KEY ADVAN-TAGES	Minimizes transportation risk for large quantities of material (2.4 million cubic yards). Keeps materials at the site that can be managed safely within site imposed constraints. Does not "shift" custodial care for these materials elseware. Reserves capacity offsite for other materials from other sites that cannot be managed safely within site imposed constraints. Minimizes transportation "opportunity costs" such as for fossil fuel consumption and air pollution along transportation route. Lowest total cost option to taxpayer.	Provides highest level of certainty of long-term protection of human health and environment at the FEMP site. Eliminates perpetual institutional care requirements at FEMP. Frees up the maximum footprint of FEMP land for available alternate use. Eliminates reliance on modeling forecasts/ future projections of risk that cannot be quantified with a high level of certainty.
KEY CONCERNS	Relies on models to assess future potential risk and degree of protection provided. Triggers need for perpetual institutional care of the waste disposition area. Engineering and institutional controls must be relied upon to provide protection over the long term. Requires dedication of approximately 10% of FEMP property to perpetual care.	Transportation risks and logistics of shipping 2.4 million cubic yards of material more than 1500 miles. Relies upon forecasted disposal capacities nationwide which remain uncertain. Relies upon State acceptance of transportation along the route and disposal at the receiving States. Less control over the ultimate costs of the remedy (disposal site capacity and nationwide demand for such capacity come into play for FEMP remedy).

ON-SITE DISPOSAL OVERVIEW

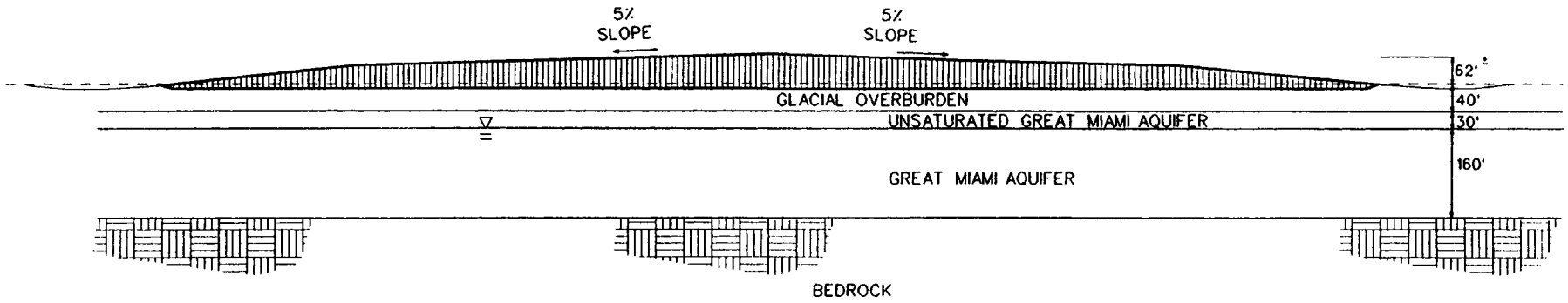
DESIGN PARAMETERS FOR DISPOSAL FACILITY

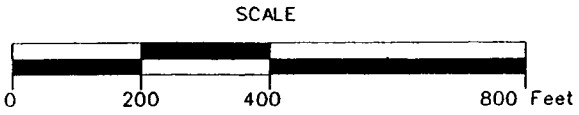
- The proposed disposal facilility for Fernald consists of a multilayered cap and bottom liner to isolate the contaminated material for above-grade disposal. Figure 1 provides a to-scale cross-section of the cell as currently envisioned.
- Cell is designed to minimize infiltration of water into waste and remove any water that does reach the waste. These design parameters are illustrated in Figure 2.
- Maximum reliance is on natural materials of construction (i.e., clay and gravel) and on-site materials to extent practical.
- Isolates waste from human and biotic intrusion.
- Provides for leachate detection and collection.
- Gradual slope on cap to minimize erosion and infiltration.
- Material is placed in cell in bulk (no containers) and compacted in layers to inhibit settlement.
- Construction is phased to minimize exposed contaminated material.
- The layers of the cap as illustrated in Figure 3 are:

Vegetative Layer	Provides rooting zone for vegetation. Provides water storage for plant growth. Protects underlying biotic barrier from erosion. Frost protection (together with the filter layer). Vegetation transpires moisture back to the atmosphere, reduces infiltration, stabilizes soil against erosion, and competitively excludes deep-rooted plants.
Filter Layer	Prevents piping of soil into biotic barrier. Drains infiltration from vegetative layer and retards further root growth. Frost protection (together with the vegetative layer).
Biotic Layer	Prevents root growth and animal intrusion. Prevents inadvertent human intrusion. Serves as backup erosion and frost protection if upper layers are eroded.

FERNALD CITIZENS TASK FORCE

Figure 1. SCALE VIEW OF CELL

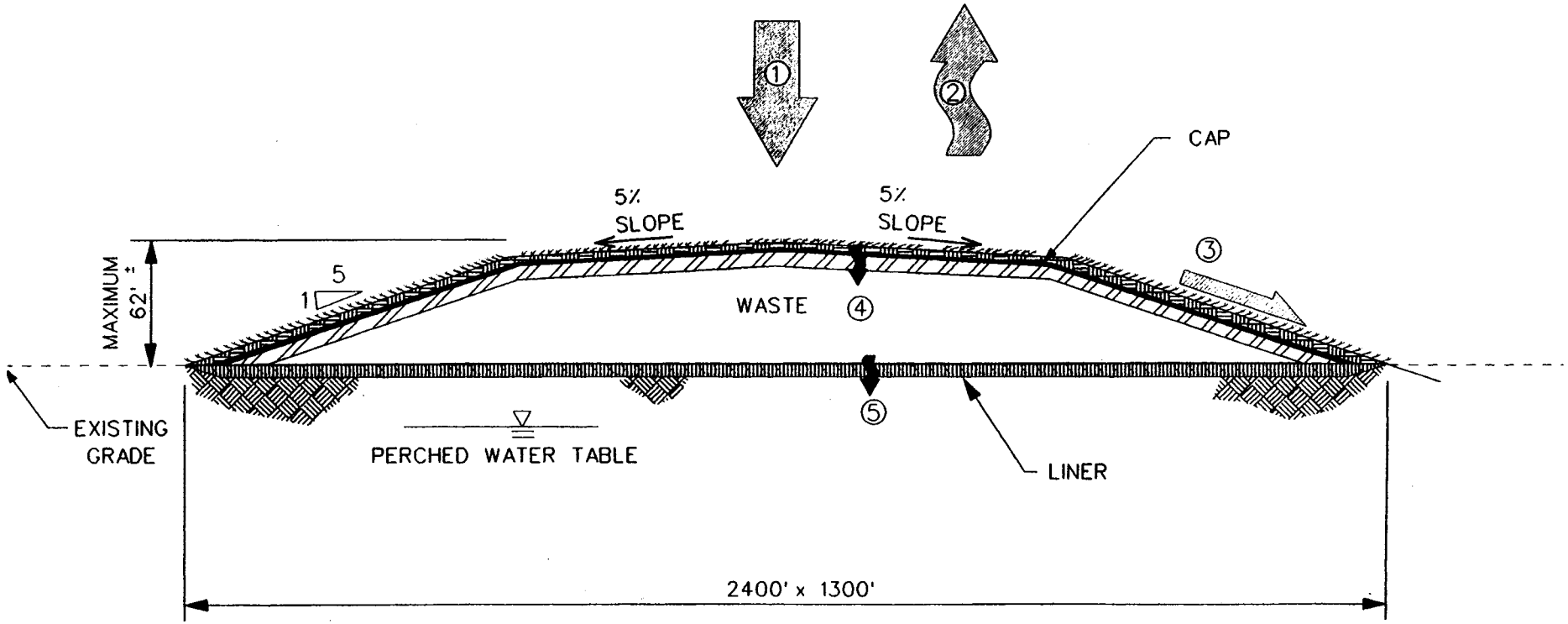




		EXPECTED (inches/year)	MODELED (inches/year)
①	RAINFALL	40.6	40.6
②	EVAPOTRANSPIRATION	30.0	30.0
③	DRAINAGE	10.5	9.0
④	FLOW THROUGH WASTE	0.1	1.2
⑤	FLOW INTO SOIL	0	1.2

FERNALD CITIZENS TASK FORCE

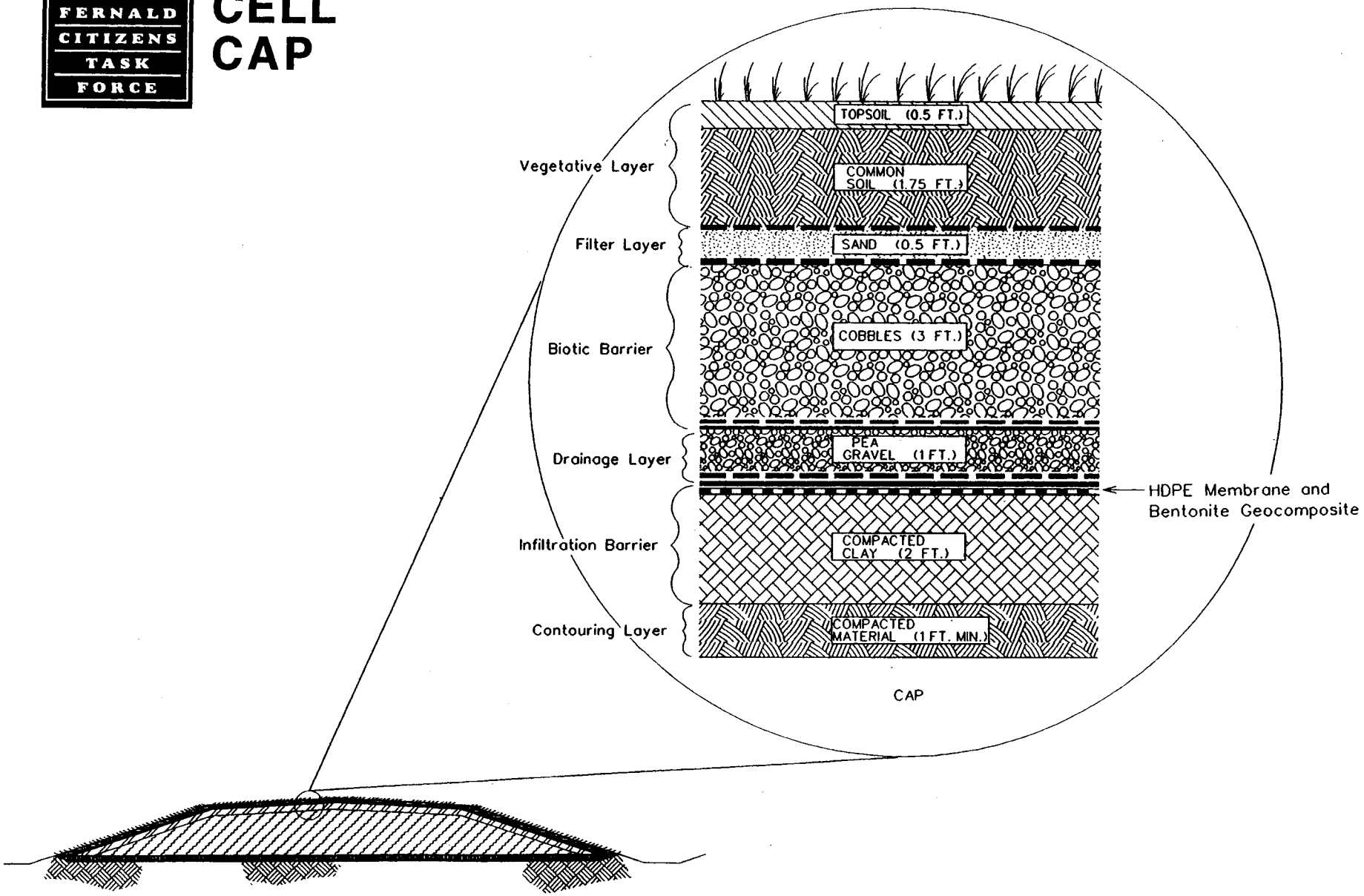
Figure 2. DESIGN OF CELL



(SCALE EXAGGERATION: APPRQXIMATELY 1-VERTICAL TO 5-HORIZONTAL)

FERNALD CITIZENS TASK FORCE

Figure 3. CELL CAP



DESIGN PARAMETERS FOR DISPOSAL FACILITY (continued)

Drainage Layer	Drains water laterally off infiltration barrier, thus reducing water pressure on barrier and infiltration through cap system. Protects infiltration barrier from larger rock in biotic barrier.
Infiltration Barrier	Barrier against infiltration of moisture into disposed material. Barrier against emanation of radon.
Contouring Layer	Allows construction of proper contours on which to lay cap system.

- The layers of the bottom liner as illustrated in Figure 4 are:

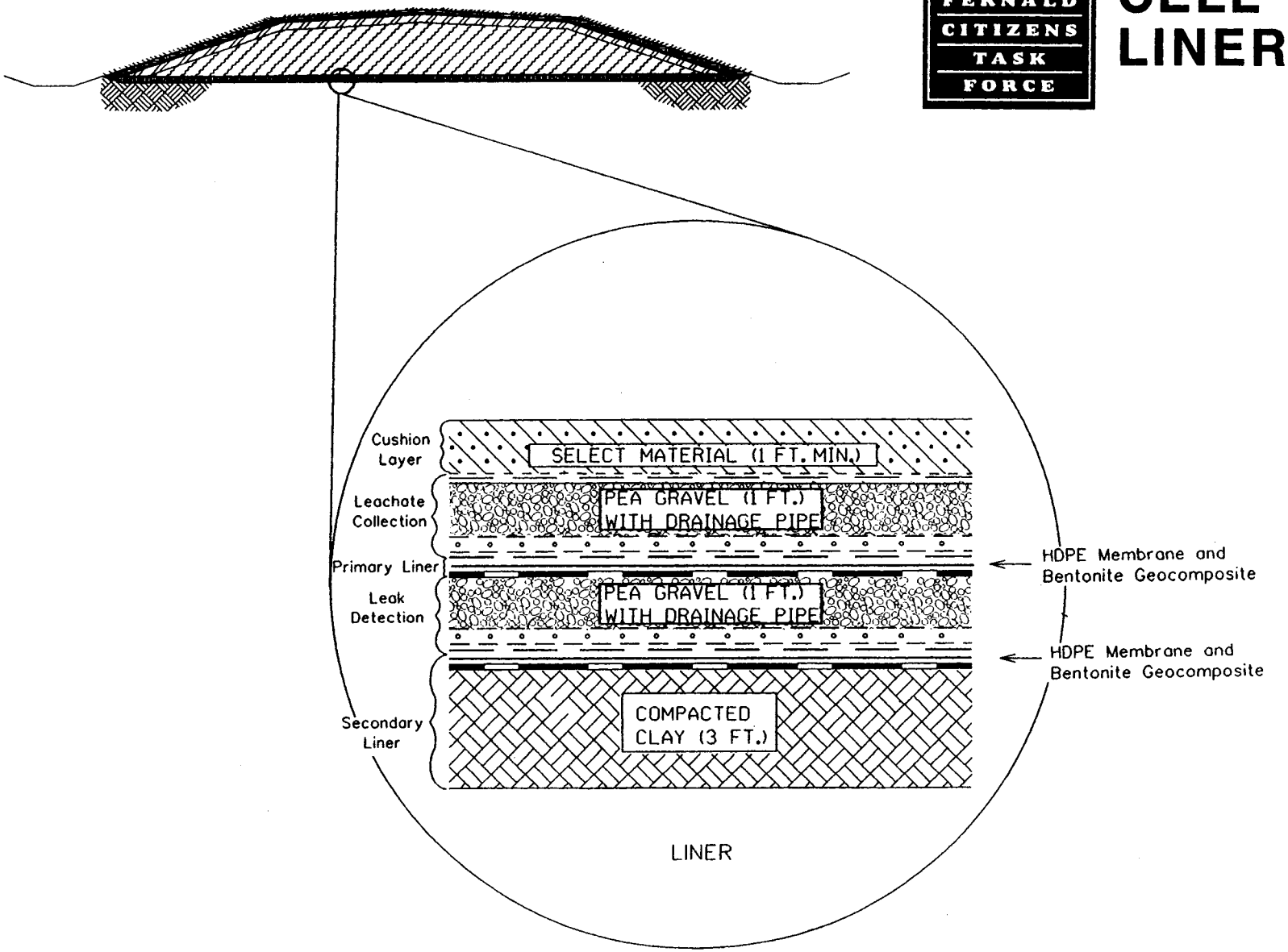
Cushion Layer	Prevents debris within disposed material from damaging liner system.
Leachate Collection System	During construction, captures water that runs off or infiltrates through waste. Following completion of construction, captures water that infiltrates cap system Captured water drains laterally to central collection facility, and water pressure on primary liner is reduced.
Primary Liner	Minimizes downward vertical movement of water during and after construction.
Leak Detection	Provides a means of determining if primary liner system is functioning properly. Intercepts and collects water that passes through primary liner. Captured water drains laterally to central collection facility, and water pressure on secondary liner is reduced.
Secondary Liner	Provides final engineered barrier against downward vertical movement of water that has infiltrated or run off the disposed material.

LOCATION OF DISPOSAL FACILITY

- Best available site geology (ongoing siting study has narrowed best geology to the northeast portion of FEMP).
- Location must take into account minimizing aesthetic impact on neighbors.
- State required buffer zones:
  300 foot required by State from line
  1,000 feet from nearest domicile or well.

FERNALD CITIZENS TASK FORCE

Figure 4. CELL LINER



WASTE ACCEPTANCE CRITERIA

- Maximum concentration for uranium in disposal facility is 1,080 ppm.
- Maximum concentration for other contaminants also required to protect aquifer to MCLs for 1,000 years.
- Waste acceptance criteria based on Fernald wastes only.
- Limitations will be placed on maximum size of construction debris to ensure cell stability. Construction debris must be mixed with soil to ensure stability.

REGULATORY REQUIREMENTS

- Placement of waste over sole source aquifer requires a waiver from State of Ohio regulation. Waiver based on demonstration that facility design in combination with geology will provide an equivalent standard of performance.
- Must meet Federal and State facility liner and cap design requirements.

PROJECTED CAPACITY AND SIZE

- Approximately 2,4000,000 cubic yards being considered for on-site disposal under Task Force recommended cleanup levels.
- Size will be determined by final volumes and aesthetic parameters, conceptual design for cell size is 2400' x 1300' or approximately 72 acres. The 300' buffer zone would encompass an additional 59 acres.
- As conceptually designed average height will be 56 feet and maximum height will be 62 feet at peak.

COST

- Total disposal facility capital cost is $420 million ($175 per cubic yard).
- Total disposal facility annual operation and maintenance cost is $1.4 million.

MAINTENANCE/MONITORING/INSTITUTIONAL REQUIREMENTS

- Continued Federal ownership of disposal facility area.
- Permanent Markers identifying location of disposal facility.
- Fencing around disposal facility, similar to current site fencing.
- Long-term groundwater monitoring system.
- Long-term leachate collection system.
- Routine inspections and sampling every six months.
- Maintenance of cap as required.
- Reviews of system performance, at least every five years by DOE and EPA.

RETRIEVABILITY

- Consolidation without waste form modification permits future recovery in the event of improved or cost-effective treatment.

LONG-TERM PERFORMANCE

- Modeled performance of disposal cell for 1,000 years into future.
- Waste acceptance criteria was developed under assumed failure of synthetic components of cap and lining systems.
- Conservative assumptions used for underlying geology.

DURATION

- Earliest possible receipt of contaminated material in disposal facility is fall 1997.
- Disposal is expected to continue through 2017 (20 years), but will be dependent upon budgets and progress of building demolition.

RISK DURING IMPLEMENTATION

- Risk to on-site remedial workers:

Carcinogenic	7.3×10^{-3} (without respirators, see note)
Carcinogenic	7.3×10^{-4} (with respirators, see note)
Non-carcinogenic	HI = 27
Mechanical injuries	200
Mechanical fatalities	0.8

Note on use of respirators:
Use of respirators is not assumed unless air emissions are at levels requiring their use because of expense, loss of productivity, and increased risk of accident. Workers are at increased health risk due to stress and fatigue. Decreases in efficiency result in more time to perform the task and thus increased exposure to mechanical accident. Decreased visibility and communication also contribute to increased risk of accident. Use of personal protective equipment including half-mask respirators increase project costs by $26,300 per worker per year.

- Risk to on-site non-remedial workers:

Carcinogenic	5.3×10^{-7}
Non-carcinogenic	HI = 0.0038

- Risk to off-property public at fenceline:

Carcinogenic	4.4×10^{-7}
Non-carcinogenic	HI = 0.0024

USE OF MAN-MADE LINER MATERIALS AT FERNALD

- **The proposed waste disposal cell** design relies completely on natural materials to achieve the 1,000 year design life. Man-made high density polyethylene (HDPE) liners are included in the design for compliance with the legal requirements of the design and because they provide redundant protection during the short-term while the water level in the contaminated material placed in the cell reaches equilibrium. The HDPE is not expected to last 1,000 years however, and is not considered in the modeling of disposal cell performance.

- **The storm water retention basin** constructed in 1986 uses a man-made liner of a 40 mil synthetic fiber combined with 18" of soil-bentonite mix and drainage to detect and collect leaks. Holes thought to be caused by stones beneath the synthetic liner were found during repairs in 1994. Liner seams were sound.

- **The biosurge lagoon** constructed in 1985 uses the same double liner design as above using HDPE, however, the placement of drainage pipes resulted in only 6" of soil-bentonite beneath the pipes which resulted in some leaks. The system has since been redesigned to add 6" of sand above the HDPE liner with a resin coated fabric on top. Some leaks were detected early on, but is now considered to be performing well.

- **Pit 5** constructed in 1968 was installed with a rubber liner that had a 15 year guarantee. Initial inspection found 36 splices that had leak potential. Liner was reinforced, reinspected and put into service on October 21, 1968. Liner guarantee expired in 1983.

FERNALD CITIZENS TASK FORCE

OFF-SITE DISPOSAL OVERVIEW

OFF-SITE DISPOSAL LOCATIONS

- There are two U.S. facilities available to accept the waste types found at Fernald.

- Nevada Test Site
  - DOE owned and operated facility
  - Located 65 miles northwest of Las Vegas, Nevada
  - Waste disposed in shallow pits and trenches with earthen cover

- Envirocare
  - Commercially owned and operated facility
  - Located near Clive, Utah 80 miles west of Salt Lake City
  - Waste disposed in clay lined cells

WASTE ACCEPTANCE CRITERIA

- Nevada Test Site
  - Accepts low-level nuclear wastes
  - Does not accept hazardous or mixed wastes
  - Wastes must be containerized
  - All Fernald low-level wastes meet criteria
  - No current limit on capacity.

- Envirocare
  - Accepts low-level nuclear wastes
  - Accepts hazardous wastes meeting Federal land disposal restrictions
  - Accepts both containerized and bulk wastes
  - Imposes size restrictions for debris
  - Limits concentrations of individual hazardous constituents
  - All 2.4 million under consideration meet criteria
  - 2.5 cubic yards of capacity permitted and developed
  - Up to 18 million cubic yards total capacity.

TRANSPORTATION REQUIREMENTS

- Nevada Test Site
  - 2,200 miles from Fernald
  - Truck transport, no rail service
  - 120,000 truck loads
  - Dedicated trucks
  - 15 loads per day for 20 years
  - 528 million total truck miles.
    - 176 million gallons of gas
    - 2,600 tons of CO emissions
    - 755 tons of hydrocarbon emissions
    - 28,572 tons of NOx emissions

- Envirocare
  - 1,913 miles from Fernald
  - Both truck and rail, rail preferred
  - 900 train loads
  - Dedicated trains
  - One train of 47 cars every 8 days for 20 years
  - 3.4 million total rail miles.

TOTAL COST

- To Nevada Test Site: $3.46 billion ($1,440 per cubic yard)

- To Envirocare: $1.27 billion ($530 per cubic yard)

DURATION

- 20 year estimate based on budget projections and building demolition.

RISK DURING IMPLEMENTATION

- Risk to on-site remedial workers, assuming respirators are not used:
  - Carcinogenic 4.2×10^{-3}
  - Non-carcinogenic HI = 18
  - Mechanical injuries 138
  - Mechanical fatalities 0.6

- Risk to on-site non-remedial workers:
  - Carcinogenic 4.4×10^{-7}
  - Non-carcinogenic HI = 0.0025

RISK DURING IMPLEMENTATION (continued)

- Risk to off-property public at fenceline:
  - Carcinogenic 3.6×10^{-7}
  - Non-carcinogenic HI = 0.002

- Risk to off-property transportation worker:

  Envirocare Option
  - Carcinogenic 1.5×10^{-5}
  - Transportation injuries 15
  - Transportation fatalities less than 1

  Nevada Test Site Option
  - Transportation injuries 29
  - Transportation fatalities 2

- Risk to public along transportation route:

  Envirocare Option
  - Carcinogenic 1×10^{-7}
  - Transportation injuries 22
  - Transportation fatalities 6

  Nevada Test Site Option
  - Transportation injuries 86
  - Transportation fatalities 9

RISK DURING IMPLEMENTATION

- Risk to on-site remedial workers:

Carcinogenic	7.3×10^{-3} (without respirators, see note)
Carcinogenic	7.3×10^{-4} (with respirators, see note)
Non-carcinogenic	HI = 27
Mechanical injuries	200
Mechanical fatalities	0.8

Note on use of respirators:
Use of respirators is not assumed unless air emissions are at levels requiring their use because of expense, loss of productivity, and increased risk of accident. Workers are at increased health risk due to stress and fatigue. Decreases in efficiency result in more time to perform the task and thus increased exposure to mechanical accident. Decreased visibility and communication also contribute to increased risk of accident. Use of personal protective equipment including half-mask respirators increase project costs by $26,300 per worker per year.

- Risk to on-site non-remedial workers:

Carcinogenic	5.3×10^{-7}
Non-carcinogenic	HI = 0.0038

- Risk to off-property public at fenceline:

Carcinogenic	4.4×10^{-7}
Non-carcinogenic	HI = 0.0024

USE OF MAN-MADE LINER MATERIALS AT FERNALD

- **The proposed waste disposal cell** design relies completely on natural materials to achieve the 1,000 year design life. Man-made high density polyethylene (HDPE) liners are included in the design for compliance with the legal requirements of the design and because they provide redundant protection during the short-term while the water level in the contaminated material placed in the cell reaches equilibrium. The HDPE is not expected to last 1,000 years however, and is not considered in the modeling of disposal cell performance.

- **The storm water retention basin** constructed in 1986 uses a man-made liner of a 40 mil synthetic fiber combined with 18" of soil-bentonite mix and drainage to detect and collect leaks. Holes thought to be caused by stones beneath the synthetic liner were found during repairs in 1994. Liner seams were sound.

- **The biosurge lagoon** constructed in 1985 uses the same double liner design as above using HDPE, however, the placement of drainage pipes resulted in only 6" of soil-bentonite beneath the pipes which resulted in some leaks. The system has since been redesigned to add 6" of sand above the HDPE liner with a resin coated fabric on top. Some leaks were detected early on, but is now considered to be performing well.

- **Pit 5** constructed in 1968 was installed with a rubber liner that had a 15 year guarantee. Initial inspection found 36 splices that had leak potential. Liner was reinforced, reinspected and put into service on October 21, 1968. Liner guarantee expired in 1983.

Comparison of Constrained and Unconstrained Funding Scenarios

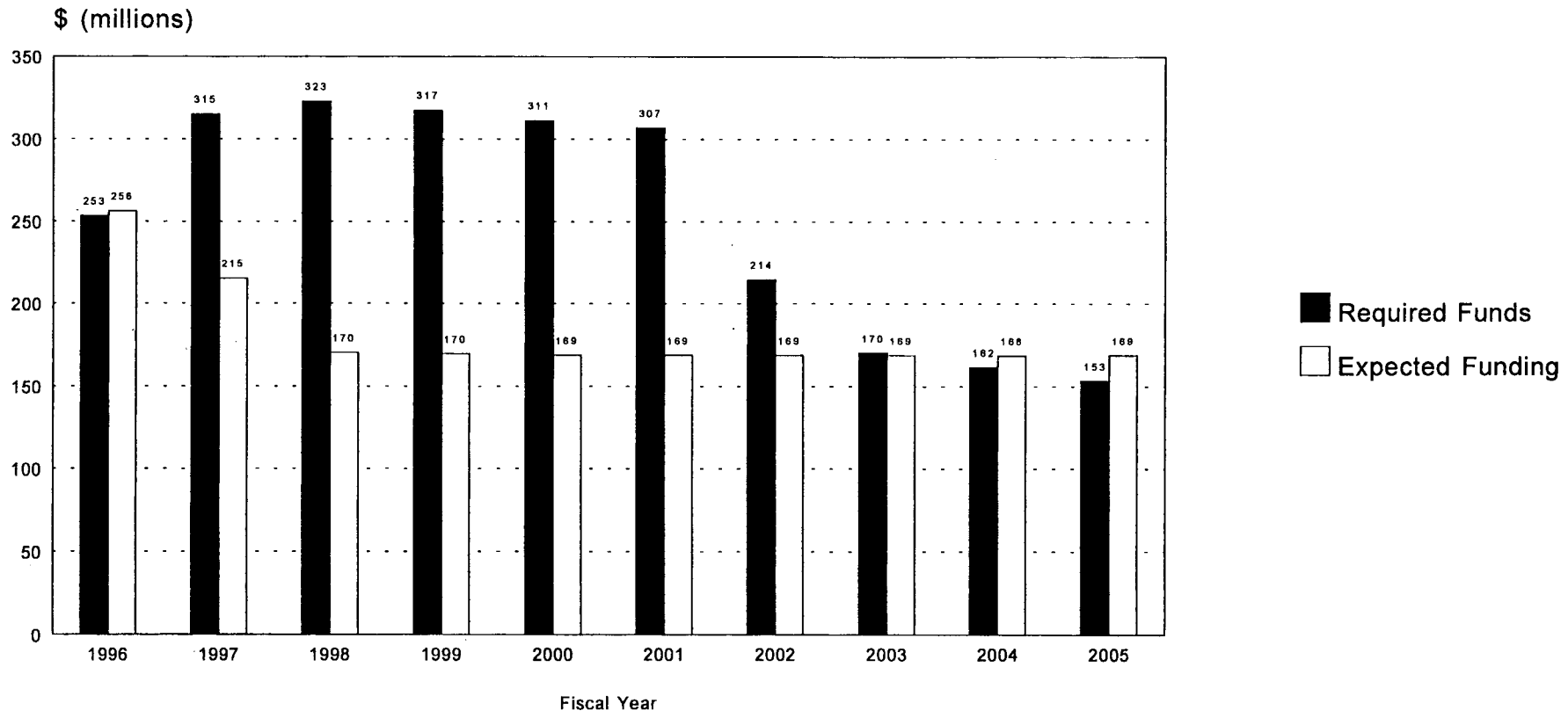
Activity Description	*Duration in Months/ (Approx. End Date) 10-Year Schedule*	*Cost in FY-95 Dollars 10-Year Schedule*	*Duration in Months/ (Approx. End Date) 25-Year Schedule*	*Cost in FY-95 Dollars 25-Year Schedule*
OU 1 Response Actions	84 (2003)	$371,000,000	168 (2009)	$622,000,000
OU 2 Response Actions	57 (2001)	$46,000,000	36 (1999) - 24 (2011)	$61,000,000
Inactive Flyash Pile	12	$9,400,000	1999	
Active Flyash Pile	12	$9,100,000	1999	
South Field	12	$9,300,000	1999	
Landfill	3	$9,000,000	2011	
Lime Sludge	2	$9,200,000	2011	
On-Property Disposal Facility	* (2006)	$127,000,000	48 (2002) - 132 (2020)	$166,000,000
OU 3 Response Actions	108 (2004)	$291,000,000	48 (2002) - 108 (2017)	$319,000,000
Safe Shutdown Summary	48	$39,000,000	2000	
Building/facility D&D; Waste Dispositin	108	$252,000,000	2017	
OU 4 Response Actions	84 (2003)	$145,000,000	96 (2004)	$167,000,000
OU 5 Response Actions	**	$261,000,000	300 (2020)	$329,000,000
Groundwater	**	$81,000,000	(2020)	
AWWT operations thru 2005	120	$58,000,000	(2020)	
Soil	120 (2005)	$122,000,000	96 (2019)	
Legacy Waste Management	12 (1997)	$22,000,000	24 (1998)	$60,000,000
Administration/Project Management	120 (2006)	$536,000,000	300 (2020)	$766,000,000
Landlord	120 (2006)	$420,000,000	300 (2020)	$840,000,000
TOTAL		**$2.2 Billion**		**$3.3 Billion**

* Earliest possible date the on-property disposal facility will be available to receive materials is August 1, 1997. The cap will be in-place 12 months following the receipt of last materials.

** OU5 response actions — specifically groundwater — will continue until completion in 2020. Operation of AWWT will continue as necessary beyond 2005 to attain discharge limitation to the Great Miami River.

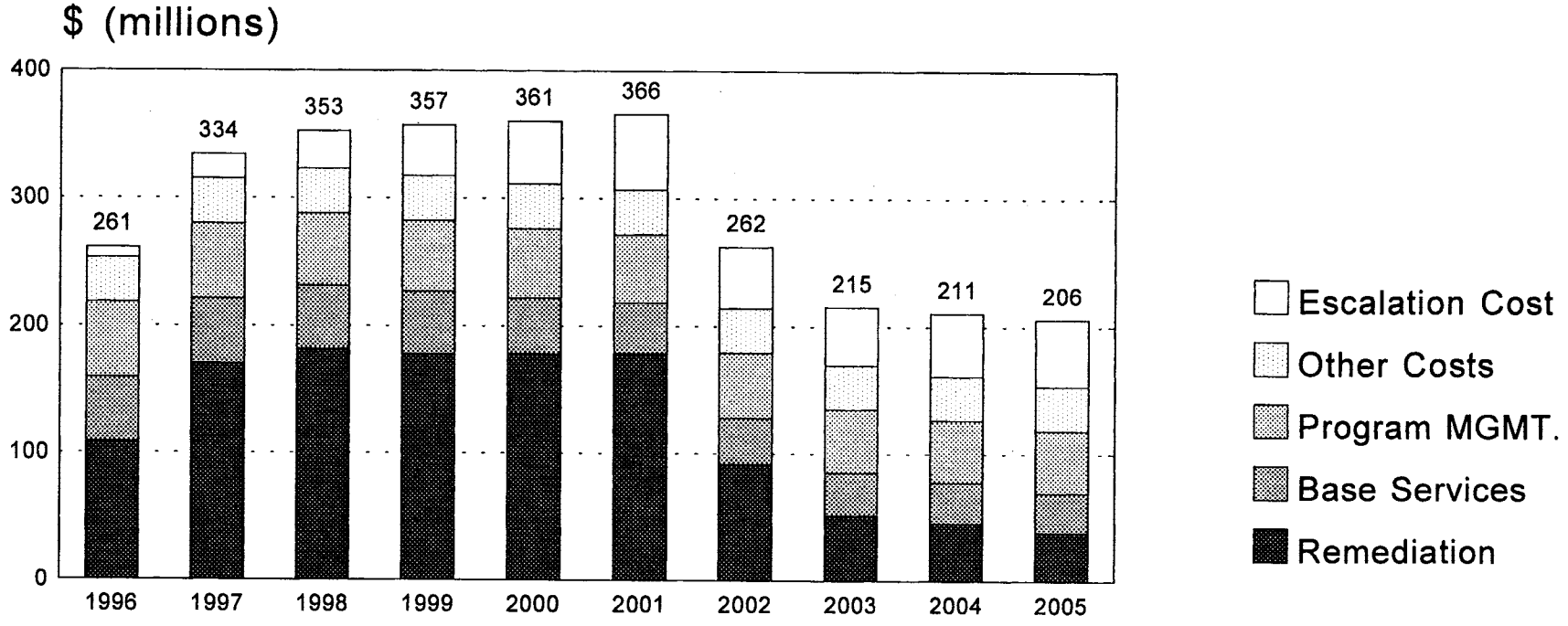
10-YEAR CLEANUP SCENARIO

FEMP Funding Required vs Expected Funding - Unescalated



Constant 1995 dollars.

10-Year Cleanup Scenario
Cost Projection with Escalation



	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005
Escalation Cost	8	19	30	40	49	60	48	45	49	53
Other Costs	35	35	35	35	35	35	35	35	35	35
Program MGMT.	59	59	56	55	54	53	51	50	49	49
Base Services	51	51	50	49	44	40	36	34	32	31
Remediation	109	171	182	178	178	179	92	51	45	38

Fiscal Year

Other costs include DOE support and fees.
Escalation estimated at 3% per annum.
1995 is Base Year.

APPENDIX F

Overview of FutureSite Exercise

FutureSite

Introduction and Instructions

INTRODUCTION

The Fernald Environmental Management Project (Fernald), formerly the Feed Materials Production Center, produced high-purity uranium metal from uranium ore for the US Department of Energy's Nuclear Weapons Complex. During its years of operation from 1953 to 1989, it is estimated that 1,000,000 pounds of uranium were discharged to the environment, most of it in the form of airborne dust emissions, of which most settled on the soil around the plant. A large aquifer runs under the plant, and parts of it are severely contaminated with uranium from surface run-off and leachate from disposal pits and production processes. Other hazardous substances are present at Fernald, but uranium is by far the most significant; with a few exceptions, cleaning up the uranium will clean up everything else. Fernald is listed in the National Priorities List for Superfund cleanup, and an agreement is in place to accomplish it.

Citizens who live near Fernald have been actively encouraging cleanup since 1984, and in recent years the site management has increasingly sought the input of the public in cleanup decision-making. In 1993, the Department of Energy established a "site-specific advisory board" — the Fernald Citizens Task Force — comprising representatives of numerous stakeholder groups, to advise it on key cleanup decisions. *FutureSite* was developed to help members of the Task Force to visualize the complex and interrelated contamination issues at Fernald.

As is the case at many Superfund sites, cleanup at Fernald requires the removal and/or treatment and/or disposal of hazardous waste and of environmental media (soil and groundwater) contaminated by those wastes. There is little dispute over the need to remove and/or treat and/or dispose of the waste materials themselves — called source materials — though *how* to do it may generate considerable controversy. They present a clear danger unless neutralized or isolated. Rather, it is the cleanup of contaminated soil and water that presents a difficult problem because (A) there are large volumes of contaminated material, meaning high costs, (B) the risk presented by contaminated material is real but the harm is seldom imminent, (C) the technology for treating them is often imperfect and always costly, and (D) while they must be disposed of somewhere, no one especially wants to host them.

FutureSite addresses the media contamination. At Fernald, the cleanup question can without undue distortion be simplified to: How much uranium-contaminated soil must be removed from the site to make it acceptable safe to persons on or near it? The answer to this question is, in turn, driven by two considerations: (1) protection of the groundwater under the site, and (2) risks to persons on the surface who are in contact with the soil.

(1) The relationship of soil contamination to groundwater is not obvious, but is of critical importance. The uranium in the soil reaches the groundwater from surface runoff into streams that are in direct contact with the aquifer, and from the leaching of uranium down

through the soil to the aquifer. The more soil is contaminated and the greater its degree of contamination, the greater the risk to the aquifer.

(2) The relationship of soil contamination to persons who use the surface of the land is more direct: the more contact one has with the soil and the more contaminated the soil is, the greater the risk. Two variables must be considered, however. (a) First, the risk to a person on the surface will vary considerably depending on what that person is doing. A farmer who lives on the site would have a great deal of contact with the soil, while an occasional hiker through a wildlife preserve would have very little. Hence one cannot assign a level of safety without asking, "Safe for what?" (b) Second, one must also decide what level of risk constitutes an adequate degree of safety. A relatively risk-preferring person could farm on the same land that a risk-averse person would only feel safe hiking on.

This version of *FutureSite* concentrates on the questions arising from surface use; a version that addresses the level of soil cleanup needed to protect the aquifer is in development. If the players decide that groundwater protection is the first priority (the use of the Safe Drinking Water Act as an ARAR [Applicable or Relevant Appropriate Requirement] under CERCLA suggests this), then they would begin by removing squares to accomplish that goal. Of course, those squares must be treated and/or disposed of just like squares removed on account of surface use. On the other hand, because this is an exercise, players may wish to ignore or modify groundwater protection to explore other possible future scenarios.

OBJECTIVE

FutureSite is a simulation that models the volumes of contaminated soil that must be remediated to use the Fernald property. The objective is to determine what future use (or uses) the Fernald site should have, by removing specific concentrations of contaminated Material. The exercise ends when the players are satisfied that they have reached their desired level of cleanup to achieve their vision of Fernald's future use, and have accounted for all of the contaminated materials by either leaving them in place or disposing of them.

COMPONENTS

- **Fernald Overview** is an introduction to the site and its contamination.
- **Map** of the Fernald facility divided into a grid of 1,000 foot squares. (Each square on the grid represents a specific volume of soil containing a specific range of contaminants allowed fro various future use categories based on risk — Restricted Access (pink), Undeveloped Green Space (yellow), Developed Park (green), Commercial/Industrial (blue) and Residential/Agricultural (white). The purple squares represent all materials that must be removed to achieve even restricted use; salmon squares represent the volume of waste from Operable Unit 3 (former production area) and Operable Unit 2 (active and inactive flyash piles, lime sludge ponds, sanitary landfill). There are also squares representing non-soil — flyash, demolition debris, waste pits, and production wastes — materials that must be disposed of. Three sets of squares are provided so the exercise can be played at the risk levels permitted by CERCLA, 10-6, 10-5, and 10-4 excess cancer risk. (The exercise originally used colored poker chips to represent volumes and contamination levels. This configuration produced a strong visual effect, but it is very difficult to transport and reproduce. The poker chip version can be reproduced using the information on the printed squares.)

- **Disposal Options** are limited to either on-site disposal or off-site disposal. All "squares" removed must be placed into one of these disposal options. Off-site disposal is estimated to cost $1,000 per cubic yard; on-site disposal is estimated to cost $400 per cubic yard.
- **Tally Sheet** allows players to calculate the consequences of their decisions and to determine the volume of material involved in their cleanup, cost of the cleanup scenario, amount of space needed for the disposal facility, and transportation impact.

SET UP

Each grid on the map is designated with a letter and number as indicated on the top and left side of the map (A-1, A-2, A-3, etc.) The color squares are stacked on the appropriate grid square indicated on each chip. The Aquifer Cards are inserted into the stacks as indicated on the cards. (BE SURE THAT ALL OF THE SQUARES AND CARDS ARE FROM THE SAME RISK SCENARIO — 10-4, 10-5, or 10-6. DO NOT MIX THEM). The order of the colors is the same for each risk scenario — (from bottom to top) white, blue, green, yellow, pink, purple and salmon. Because the level of contamination varies across the site, not all of the squares will have all of the colors. Place the sheets representing the two disposal options (on-site and off-site) next to the board.

RUNNING THE EXERCISE

Each chip represents soil containing the range of contaminant concentrations allowable for the future use indicated on the chip. To achieve a future land use on a given square, players must remove all of the squares representing contamination at concentrations above that required for the selected use. For example, to achieve commercial/industrial use for a given square, all squares above the blue one on that square must be removed. Players can make a square "cleaner" than its intended future use to achieve a margin of safety. The level of clean determines your range of future use options.

The players first remove the squares down to the level of cleanup desired. To remove a chip, they must place it on one of the disposal option sheets, either on-site or off-site. There is a cost and impact associated with each option.

- **Off-Site Disposal -** Material placed in off-site disposal is assumed to go to a long-term disposal facility in an arid part of the western United States, thus incurring substantial transportation and disposal costs. Due to its high degree of hazard, source Material from the silos and waste pits have already been placed in this category. The volume of off-site disposal is limited to 1,000,000 cubic yards in total.
- **On-Site Disposal -** Contaminated material left on site for disposal will be disposed of in an engineered facility to isolate it from the ambient environment. It is assumed that each 13,000 cubic yards of contaminated material will require one acre of land for a disposal facility, including all ancillary operations and buffer space. Space on site must be reserved for placement of disposal facilities at the completion of the exercise. Because operation of a disposal facility is considered a commercial/industrial activity, the area selected for the on-site disposal cell must first be cleaned at least to a commercial/industrial use level.
- **Treatment -** For technical reasons, soil treatment was not feasible at Fernald, so it is not part of this exercise.

FUTURE USES AND CHIP VALUES

FUTURE USE CATEGORY	CLEANUP LEVELS AND RANGES AT 10^{-4}	CLEANUP LEVELS AND RANGES AT 10^{-5}	CLEANUP LEVELS AND RANGES AT 10^{-6}
Restricted Access (Pink)		1,739 ppm (> 1,739 ppm = purple)	180 ppm (> 180 ppm = purple)
Undeveloped Green Space (Yellow)	8,820 ppm	1,259 ppm (1,259-1,739 ppm)	132 ppm (132-180 ppm)
Developed Park (Green)	3,490 ppm (3,490-8,820 ppm)	390 ppm (390-1,259 ppm)	42 ppm (42-132 ppm)
Commercial/Industrial (Blue)	1,200 ppm (1,200-3,490 ppm)	138 ppm (138-390 ppm)	18 ppm (18-42 ppm)
Residential/Agricultural (White)	130 ppm (130-1,200 ppm)	21 ppm (21-138 ppm)	6 ppm (6-18 ppm)
Background (Board)	3.6 ppm	3.6 ppm	3.6 ppm

FINISHING THE EXERCISE

After the players have removed all the squares necessary to achieve their cleanup and future use goals, they can calculate the total volume of materials removed, dollar cost, transportation impact, and space needed (if any) for on-site disposal by adding up the appropriate values from all of the squares in each disposal option. They will also want to fix a location for on-site disposal (if any), taking the geography and infrastructure of the site into account.

KEY ASSUMPTIONS

Uncertainty in Volume and Cost Data

Soil volumes and cost data were developed using the best available data, but are only estimates of actual values. As the concentrations of soil contaminants get lower, it becomes harder to assure the accuracy of the measurement data; consequently, confidence in the precision of the soil volumes gets lower. Approaching "background" levels of cleanup, the volume of soil represented could be several times that currently generated by the model used to calculate these volumes.

Treatment and handling costs will vary based on the type of material, volume, technology, etc. The cost estimates for *FutureSite* are based on average costs for similar activities and simplified for the purpose of this exercise. Like soil volumes, cost data should be used for relative comparisons of solutions, not as actual cost estimates.

Risk and Cleanup Level

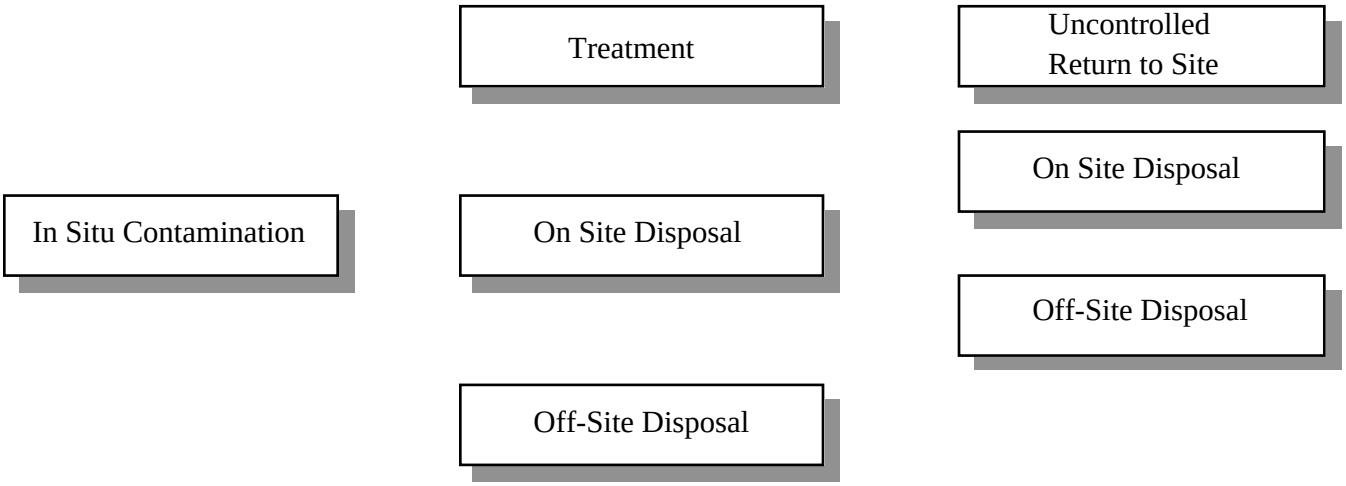
An arbitrary limit of one million cubic yards has been placed on off-site disposal to reflect realistic logistical and political considerations. At present there are only two facilities able to accept large

volumes of low-level radioactive waste from Fernald. Both face significant political pressures on accepting large amounts of out-of-state wastes and one has a limited capacity for new waste. Players may choose to exceed this limit for off-site disposal for this exercise, but the ability to dispose of greater than one million cubic yards is currently considered unlikely.

Source Material
A number of decisions regarding disposition of source material from various operable units have already been drafted and have been incorporated into the exercise according to the potential impact on future use. Source materials from the silos and the waste pits are assumed to be completely removed and disposed of off-site. Therefore, they will not affect the use of the site, but their volume is included in off-site disposal, limiting that option. Players, however, are free to move these volumes into on-site storage if they wish. Debris from site buildings has also been designated by salmon squares in the production area, and it can be disposed of on- or off-site.

Off-Site Contamination
In this exercise off-site contamination has been ignored. It is not anticipated that large volumes of off-site soil will need to be excavated.

Treatment
Even though a treatment option is not included in the present exercise, it could be added as a way-station between the map and eventual disposal, as follows:



Because treatment is just an intermediate step, it results in a contaminated fraction and a "clean" fraction. The contaminated fraction is highly concentrated and must go off-site. Depending on the efficacy of the treatment, the clean fraction can either be returned uncontrolled to the site, or (if it is still above the hazard threshold) placed in an on-site or off-site disposal facility. In the latter case, disposal costs and impacts still accrue. An earlier version of the exercise assumed a cost of $300/cubic yard, and a contaminated/clean ration of 30/70.

FutureSite

TALLY SHEET

ON-SITE DISPOSAL

Total cubic yards of purple = _____

Total cubic yards of red = _____

Total cubic yards of yellow = _____

Total cubic yards of green = _____

Total cubic yards of blue = _____

Total cubic yards of white = _____

TOTAL VOLUME = _____

SIZE OF DISPOSAL CELL (in acres):

Total volume _____ ÷ 13,000 = _____

TOTAL COST:

Total volume _____ x $400 = _____

OFF-SITE DISPOSAL

Total cubic yards of purple = _____

Total cubic yards of red = _____

Total cubic yards of yellow = _____

Total cubic yards of green = _____

Total cubic yards of blue = _____

Total cubic yards of white = _____

Volume from Waste Pits = 630,200

Volume from Silos = 13,990

TOTAL VOLUME = _____

COST:

Total volume _____ x $1,000 = _____

TRUCKLOADS:

Total volume _____ ÷ 25 = _____

TRAINLOADS (40 cars each):

Total volume _____ ÷ 80 = _____

TOTAL COST OF FUTURE USE SCENARIO:

Total for On-Site Disposal _____ + Total for Off-Site Disposal _____ = _____

APPENDIX G

Acknowledgements

ACKNOWLEDGEMENTS

The Fernald Citizens Task Force would like to thank the following people, whose skills and support were instrumental to our success:

Leroy Abirached
Ken Alkema
Judy Armstrong
Jan Arnett
Martha Bean
Don Beck
John Bradburne
Bill Breen
Dave Brettschneider
Dennis Carr
J.D. Chiou
Rachel Clark
John Coleman
Brad Conley
Bob Conner
Jack Craig
Jennifer Curtis
Nolan Curtis
Dave Dravland
Amy Engler
Erich Evered
John Flinn
Jeanie Foster
Kathy Graham
Suzanne Gray
Glen Griffiths
Terry Hagen
Shannon Heaton
Laura Hegge
Jack Hoopes
Diane Holmes
Arlen Hunt
Nancy Huser
Jim Jackson
Rob Janke
Marc Jewett
Cindy Kelly
Tina Kreuger
Sheila Little
Julie Loerch
Andrew Martyniuk
Jenny McClamrock
Ron Merkley
Dave Miller
Ken Morgan
Mitch Morgan
Steve Oberjohn
Don Ofte
Sue Olensky
Ken Opdyke
Pam Pies
Ron Platania
Tim Poff
Resha Putzrath
Johnny Reising
Crystal Sarno
Doug Sarno
Tom Schneider
Alice Shorett
Cheri Smyser
Sarah Snyder
Gary Stegner
David Stickney
Ric Strobl
James Thiesing
Alan Theyken
John Timmers
Ruth Triplett
Chris Varner
Bob Walker
Lisia Walker
Nancy Weatherup
Sherri Webb
Ron White
Lisa Winkler
Tom Winston
Mike Yates
Pete Yerace